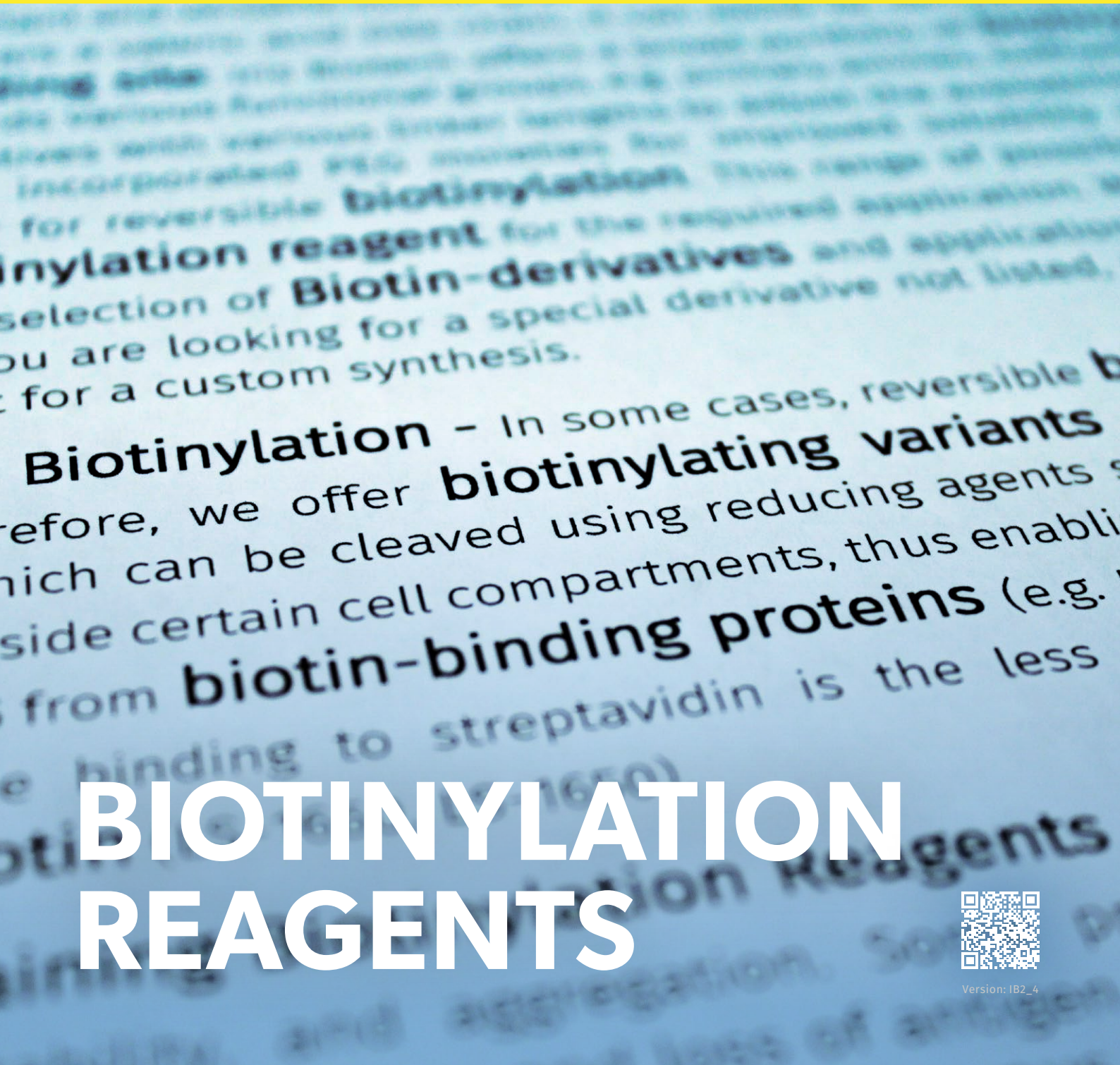
Iris Biotech



BIOTINYLATION REAGENTS

Version: IB2_4

Empowering Peptide Innovation

With this guiding theme in mind, Iris Biotech's mission is to support researchers by supplying

- innovative technologies,
- rare compounds,
- as well as a broad portfolio on standard consumables,

available in flexible quantities from small scale to bulk quantities. To fulfill our dedication "Empowering Peptide Innovation", we are attending various conferences, symposia, and exhibitions each year. This allows us to remain in direct contact with scientists all over the world, both from academia and industry, to exchange knowledge, and to gather new ideas to tackle your current challenges.

Guided by our dedication to provide

- competent service,
- as well as novel substances and
- latest technologies,

Iris Biotech is your trusted partner for the world of peptides, while having strong expertise in associated disciplines. Thus, our portfolio comprises reagents and tools for the synthesis and modification of peptides, e.g., amino acids, resins and solvents but also for related technologies such as drug delivery, linkerology® and life sciences.

Owed to the growing demand for tailor-made compounds, our portfolio is fine-tuned by our custom synthesis service at Iris Biotech Laboratories. Our skilled scientists offer profound expertise in

- *de novo* route development,
- upscaling towards larger scale production,
- as well as synthesis optimization for increased efficiency.

Examples are the synthesis of rare chiral building blocks, unnatural amino acid derivatives, sophisticated orthogonal protecting groups, heterocycles, building blocks for nucleotides, PEGs and PEG-analogs as well as specific linkers for controlled drug delivery and release.

Amino Acids ***Building Blocks*** ***Life Sciences*** ***Drug Delivery*** ***Reagents*** ***Resins*** ***Linkerology®*** ***Click Chemistry***

Portfolio Overview

Peptide Synthesis and Modification

(Protected) Amino Acids

Standards such as Fmoc-D/L-AAA and Boc-D/L-AAA, Smoc amino acids for peptide synthesis in water, variety of protecting groups (e.g., Pbf, Trt, ^{t}Bu, Bzl, Acm, Mob, SIT, Phacm, Allocam, Mmt), unusual amino acids, fluorinated derivatives, substituted prolines, arginine analogs

Building Blocks

Amino alcohols, amino aldehydes, diamines and hydrazines, (pseudoproline) dipeptides, polyamines and spermines, fatty acid derivatives, peptide nucleic acids (PNAs)

Reagents

Coupling reagents, solvents and scavengers, protecting groups

Resins

Preloaded resins (e.g., based on Trityl, TCP, TentaGel, Methoxybenzhydryl, Merrifield, PAM, Rink, Wang), scavenger resins, hydrazone resins, poly(acrylamide) resins, Cyclover

Linkerology® and Drug Delivery

Linkers for Solid Phase Peptide Synthesis

Cleavable Linkers

Val-Ala-based, Val-Cit-based, disulfide-based, Dde-helping hands, pH-sensitive linkers

Photo-Activatable Linkers

Functionalized Linkers

Clickable linkers, trifunctional linkers, linkers with maleimide function, cross-linkers, selective N-term acylation and biotinylation, 5HP2O

PROTACs

Ligands, linkers & modules

Fullerenes, Poly(2-oxazolines), Dextrans & Plant-Derived Cholesterol

Superparamagnetic Iron Oxide Nanoparticles

Poly-Amino Acids

Poly-Arg, Poly-Glu, Poly-Lys, Poly-Orn, Poly-Sar

PEGylation

Branched PEGylating reagents, (amino-)PEG-acids, PEG-amines & hydrazides & guanidines, reagents for Click-conjugation, Biotin-PEG-reagents, PEG-thiols, PEG-maleimides, other PEGylating reagents

Life Sciences

Biotinylation Reagents

Carbohydrates

Galactose, Glucose, Mannose, Xylose and others

Drug Metabolites

Peptides

Substrates & Inhibitors

E.g., protein kinase inhibitors, substrates for fusion (Halo/Snap/Clip)-tagged proteins

Natural Products

Dyes and Fluorescent Labels

E.g., ICG, AMC, DAPI

Maillard & Amadori Reaction Products

Large portfolio of derivatives useful as standards for food, pharma and cosmetics industry

Vitamins

Custom Synthesis

Your project requires a compound not listed in our portfolio?
Get in contact and inquire about our custom synthesis capabilities.

Our experienced scientists are excited to accept your synthetic challenge!
In such cases, your request undergoes the following stages:

Step-by-Step Analysis

- Customer's demands

Process Evaluation

- Detailed literature review
- Synthetic possibilities

Strategy Development

- Protocol development
- Method development and validation
- Customized synthesis

Quality Consistency

- Identity confirmation
- Purity verification

Our Service Promise

All our services are based on high standards, transparency & documentation, trust, honesty & confidentiality, as well as the required know-how.

High Standards

- Values: sustainability & responsibility
- State-of-the-art equipment & latest technologies
- High quality standards
- Qualified suppliers & regular audits

Transparency & Documentation

- Talk to our specialists – customer care
- Certificates of analysis & origin
- Impurity profiling
- Safety data sheets
- Analytical and process reports

Trust, Honesty & Confidentiality

- Intergenerational business valuing partnerships
- Meeting the customer's expectations
- Integrity towards our customers

Our Know-How

- One-step reactions & complex multi-step synthesis
- Scalability from mg to kg quantities
- Route scouting

Table of Contents

1. Background

Biotinylation describes the attachment of biotin to a protein or other macromolecule. The selective isolation of such biotin-containing molecules out of complex mixtures is based on the high affinity of avidin and streptavidin for biotin, representing one of the strongest known non-covalent interactions between protein and ligand (K_d = 10^{-15} M) and being unaffected by variations of e.g., pH, temperature, or organic solvents. Furthermore, biotin is a rather small molecule compared to other labels, minimalizing its steric impact on the biotinylated carrier itself. Thus, this nonradioactive method represents a highly important and versatile tool for purification, immobilization, and labeling.

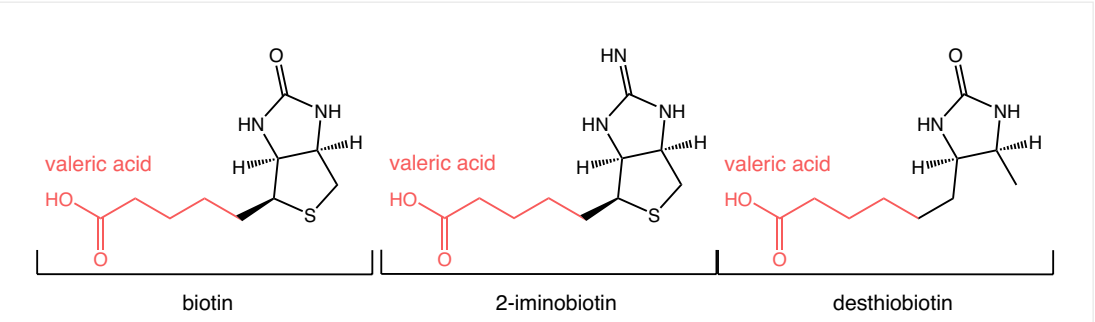


Fig. 1: Chemical structure of biotin, 2-iminobiotin, and desthiobiotin. Valeric acid moiety is highlighted in red.

As biotin bears a valeric acid side-chain, it can easily be derivatized without affecting its (strept)avidin-binding site. The reactivity can be tailored towards various functional groups, e.g., primary amines, sulfhydryls and carboxyls, as well as derivatives with various linker lengths to adjust the availability of biotin for (strept)avidin binding, with incorporated PEG moieties for improved solubility, with cleavable conjugates, or for reversible biotin labelling. This range of possibilities allows to perfectly suit the biotinylation reagent for the required application.

2-Iminobiotin and desthiobiotin also bind tightly to (strept)avidin, however, not as strong as biotin. Compounds labelled with 2-iminobiotin and desthiobiotin can therefore be gently stripped from accordingly labeled targets with buffered biotin solutions avoiding harsh denaturation conditions such as 6 M GdmCl.

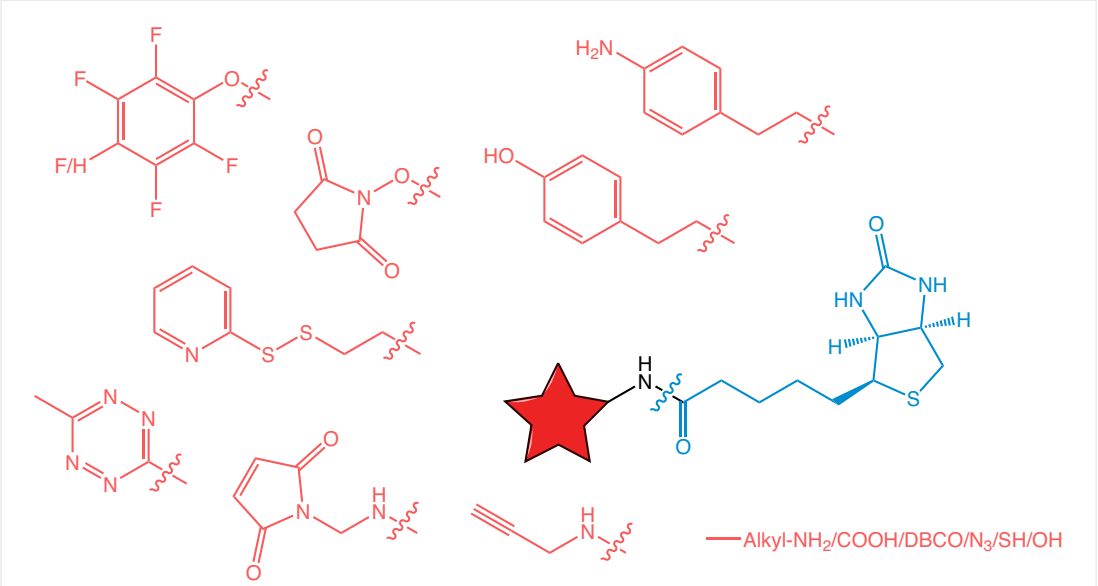


Fig. 2: Range of chemical reactivity variations for biotinylation.

Selecting the right biotinylation reagent to use for a specific application and protein of interest depends on a number of factors that must be carefully considered and optimized, including:

- Solubility – Modifications in biotinylation reagent solubility allow access to target proteins in hydrophobic or hydrophilic environments and influence the solubility of the biotinylated protein.
- Spacer arm length – The availability of biotin for (strept)avidin binding might be influenced by the length of the spacer arm.
- Cleavability/reversibility – Captured biotinylated proteins can be recovered or purified by cleaving the biotin molecule from the target protein or reversing attenuated biotin-(strept)avidin interactions.
- Functional group – Specific reactive moieties bind to certain amino acids or to the functional groups of specific amino acids for nonselective or targeted biotinylation, respectively.

Overcoming the Hydrophobic Nature of Biotin

Typical biotinylation with biotin-NHS normally results in multiple attachments, as several lysines are usually present on protein surfaces. Hence, the hydrophobic properties of biotin will influence surface polarity and solubility in aqueous conditions. In case such biotin labelling has a negative impact on the above listed protein properties, incorporation of a PEG unit between the conjugation point and biotin itself is a standard method of choice to maintain or improve physical properties of the modified protein.

PEGs are molecules comprised of repeating ethylene glycol units with solubility enhancing properties both in hydrophobic and hydrophilic environment. PEGs are considered as non-immunogenic and show promising results in numerous applications. They have a dramatic impact on protein solubility, stability, and aggregation, and improve ELISAs, IHC assays, and formulations in many aspects.

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Some protein-biotin conjugates are particularly susceptible to aggregation and loss of antigen binding ability, which can complicate assays and provide irreproducible and/or erroneous results. In comparison, biotinylated IgGs employing a PEG linker show much lower tendency for aggregation, maintain a high affinity for the antigen, and the resulting complexes with the biotin-binding proteins remain completely soluble.

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2. Amine-Reactive Biotinylation Reagents

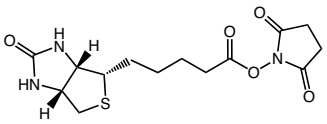
Active esters such as N-hydroxysuccinimide (NHS) esters permit a catalyst-free conjugation reaction to amines, e.g., of lysine side-chains and the N-terminus, under mild conditions. Yet, NHS esters may hydrolyze over time if, for example, atmospheric moisture has condensed on the substance. As alternatives, tetrafluorophenyl (TFP) and pentafluorophenyl (PFP) active esters can be applied that are much more resistant to hydrolysis.

Product details

RL-1006 Biotin-OSu

N-Hydroxysuccinimidobiotin

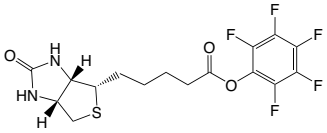
CAS-No.	35013-72-0
Formula	$C_{14}H_{19}N_3O_5S$
Mol. weight	341,39 g/mol



RL-8615 Biotin-PFP

Biotin pentafluorophenyl ester

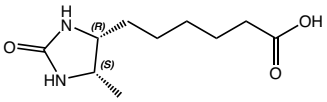
CAS-No.	120550-35-8
Formula	$C_{16}H_{15}F_5N_2O_3S$
Mol. weight	410,36 g/mol



LS-1650 D-Desthiobiotin

(4R,5S)-5-methyl-2-oxo-4-Imidazolidinehexanoic acid

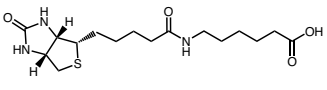
CAS-No.	533-48-2
Formula	$C_{10}H_{18}N_2O_3$
Mol. weight	214,27 g/mol



RL-2025 Biotin-Ahx-OH

6-Biotinylamino-hexanoic acid

CAS-No.	72040-64-3
Formula	$C_{16}H_{27}N_3O_4S$
Mol. weight	357,47 g/mol



Background
Amine-Reactive Biotinylation Reagents
Carboxy-Reactive Biotinylation Reagents
Reagents for Various Protein and RNA Biotinylations
Reversible Biotinylation
Sulfhydryl-Reactive Biotinylation Reagents
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Biotinylated Amino Acids
Other Biotin Reagents
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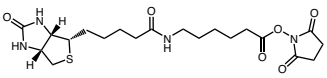
Biotinylation Reagents

Product details

RL-2020 Biotin-Ahx-NHS

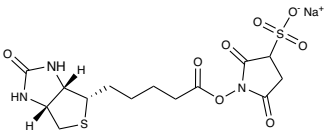
6-Biotinylamino-hexanoic acid-N-hydroxysuccinimidyl ester



CAS-No.	72040-63-2
Formula	$C_{20}H_{30}N_4O_6S$
Mol. weight	454,54 g/mol

LS-1680 Sulfo-NHS-Biotin

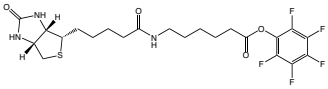
Biotin 3-sulfo-N-hydroxysuccinimide ester sodium salt



CAS-No.	194041-65-1
Formula	$C_{14}H_{18}N_3NaO_8S_2$
Mol. weight	443,42 g/mol

RL-3880 Biotin-Aca-PFP

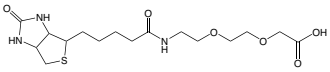
Biotin-6-aminohexanoic acid pentafluorophenyl ester



CAS-No.	273207-85-5
Formula	$C_{22}H_{26}F_5N_3O_4S$
Mol. weight	523,52 g/mol

PEG2560 Biotin-O_2Oc-OH

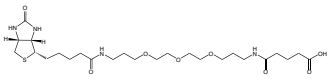
8-Biotinylamido-3,6-dioxaoctanoic acid



CAS-No.	1238575-77-3
Formula	$C_{16}H_{27}N_3O_6S$
Mol. weight	389,47 g/mol

PEG5280 Biotin-TOTA-glutaramic acid*DIPEA

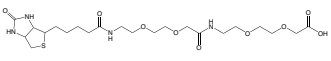
5,21-dioxo-25-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)-10,13,16-trioxa-6,20-diaza-pentacosan-1-oic acid diisopropylethylamine salt



CAS-No.	1205744-09-7
Formula	$C_{25}H_{44}N_4O_8S*C_8H_{19}N$
Mol. weight	560,70*129,30 g/mol

PEG2565 Biotin-O_2Oc-O_2Oc-OH

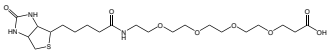
8-Biotinylamido-3,6-dioxaoctanoic acid dimer



CAS-No.	1301706-65-9
Formula	$C_{22}H_{38}N_4O_9S$
Mol. weight	534,62 g/mol

PEG1515 Biotin-PEG(4)-COOH

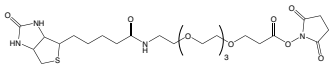
15-Biotinamino-4,7,10,13-tetraoxa-pentadecanoic acid



CAS-No.	721431-18-1
Formula	$C_{21}H_{37}N_3O_8S$
Mol. weight	491,6 g/mol

PEG1870 Biotin-PEG(4)-NHS

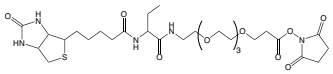
15-Biotinamino-4,7,10,13-tetraoxa-pentadecanoic acid succinimidyl ester



CAS-No.	459426-22-3
Formula	$C_{25}H_{40}N_4O_{10}S$
Mol. weight	588,67 g/mol

PEG1845 Biotin-PEG(4)-NHS-(Biotinidase resistant)

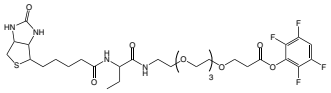
18-Biotinamino-17-oxo-4,7,10,13-tetraoxa-16-azaicosan-1-oic acid succinimidyl ester



CAS-No.	1334172-61-0
Formula	$C_{29}H_{47}N_5O_{11}S$
Mol. weight	673,78 g/mol

PEG7760 Biotin-PEG(4)-TFP-(Biotinidase resistant)

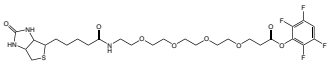
18-Biotinamino-17-oxo-4,7,10,13-tetraoxa-16-azaicosan-1-oic acid (2,3,5,6-tetrafluorophenyl) ester



Formula	$C_{31}H_{44}F_4N_4O_9S$
Mol. weight	724,76 g/mol

PEG2071 Biotin-TEG-TFP

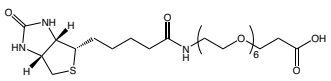
Biotin-tetra(ethylene glycol)-2,3,5,6-tetrafluorphenyl ester



CAS-No.	2985664-57-9
Formula	$C_{27}H_{37}F_4N_3O_8S$
Mol. weight	639,66 g/mol

PEG6690 Biotin-PEG(6)-COOH

21-[D(+)-Biotinylamino]-4,7,10,13,16,19-hexaoxaheneico-sanoic acid



CAS-No.	1352814-10-8
Formula	$C_{25}H_{45}N_3O_{10}S$
Mol. weight	579,7 g/mol

Background
Amine-Reactive Biotinylation Reagents
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Reagents for Various Protein and RNA Biotinylations
Reversible Biotinylation
Sulfhydryl-Reactive Biotinylation Reagents
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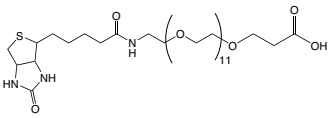
Biotinylation Reagents

Product details

PEG1051 Biotin-PEG(12)-COOH

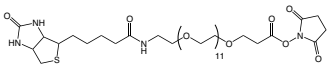
alpha-Biotin-omega-(propionic acid)-dodecae(ethylene glycol)



CAS-No. 948595-11-7
Formula $C_{37}H_{69}N_3O_{16}S$
Mol. weight 844,04 g/mol

PEG1860 Biotin-PEG(12)-NHS

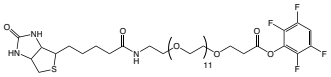
alpha-Biotin-omega-carboxy succinimidyl ester dodeca(ethylene glycol)



CAS-No. 365441-71-0
Formula $C_{41}H_{72}N_4O_{18}S$
Mol. weight 941,09 g/mol

PEG5130 Biotin-PEG(12)-TFP

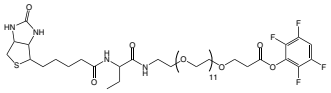
alpha-Biotin-omega-propionic acid (2,3,5,6-tetrafluorophenyl) ester dodeca(ethylene glycol)



CAS-No. 3017961-69-9
Formula $C_{43}H_{69}F_4N_3O_{16}S$
Mol. weight 992,08 g/mol

PEG7770 Biotin-PEG(12)-TFP-(Biotinidase resistant)

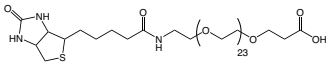
alpha-Biotinyl-(2-aminobutyryl)-omega-(2,3,5,6-tetrafluorophenyl propionate) dodeca(ethylene glycol)



Formula $C_{47}H_{76}F_4N_4O_{17}S$
Mol. weight 1077,18 g/mol

PEG4260 Biotin-PEG(24)-COOH

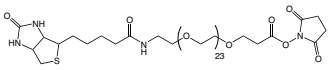
alpha-Biotin-omega-(propionic acid) 24(ethylene glycol)



CAS-No. 721431-18-1
Formula $C_{61}H_{117}N_3O_{28}S$
Mol. weight 1372,65 g/mol

PEG4250 Biotin-PEG(24)-NHS

alpha-Biotin-omega-(succinimidyl propionate) 24(ethylene glycol)

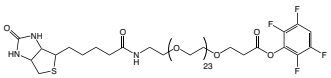


CAS-No. 365441-71-0
Formula $C_{65}H_{120}N_4O_{30}S$
Mol. weight 1469,72 g/mol

PEG7750 Biotin-PEG(24)-TFP

alpha-Biotin-omega-(2,3,5,6-tetrafluorophenyl propionate) 24(ethylene glycol)

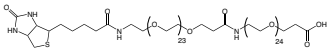
Formula $C_{67}H_{117}F_4N_3O_{28}S$
Mol. weight 1520,71 g/mol



PEG4270 Biotin-PEG(48)-COOH

alpha-Biotin-omega-(propionic acid) 48(ethylene glycol)

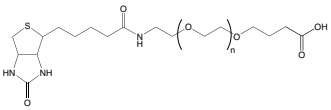
CAS-No. 721431-18-1
Formula $C_{112}H_{218}N_4O_{53}S$
Mol. weight 2500,99 g/mol



PEG1053 Biotin-PEG-COOH (3 kDa)

alpha-Biotin-omega-carboxy poly(ethylene glycol)

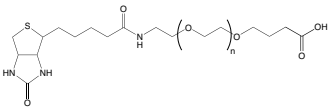
Mol. weight 3000 Da



PEG1054 Biotin-PEG-COOH (5 kDa)

alpha-Biotin-omega-carboxy poly(ethylene glycol)

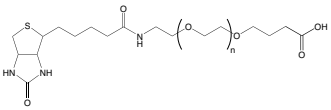
Mol. weight 5000 Da



PEG1052 Biotin-PEG-COOH (10 kDa)

alpha-Biotin-omega-carboxy poly(ethylene glycol)

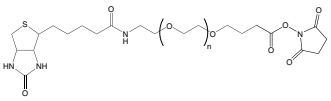
Mol. weight 10000 Da



PEG1056 Biotin-PEG-NHS (3 kDa)

alpha-Biotin-omega-carboxy succinimidyl ester poly(ethylene glycol)

Mol. weight 3000 Da



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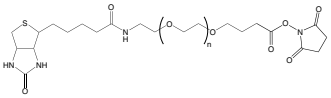
Product details

PEG1057 Biotin-PEG-NHS (5 kDa)

alpha-Biotin-omega-carboxy succinimidyl ester poly(ethylene glycol)

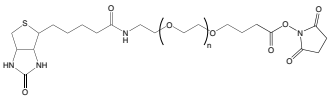
Mol. weight 5000 Da



PEG1055 Biotin-PEG-NHS (10 kDa)

alpha-Biotin-omega-carboxy succinimidyl ester poly(ethylene glycol)

Mol. weight 10000 Da



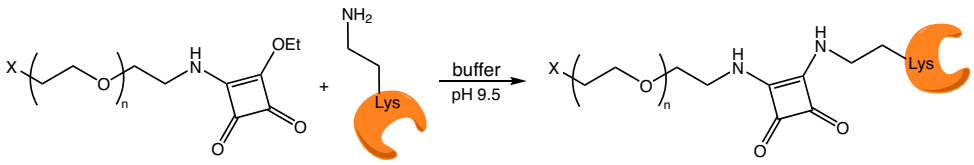


Fig. 3: Squaric acid ethyl esters chemoselectively bind to the amino side-chain functions of lysine in proteins, whereas the guanidine function of arginine, the hydroxyl groups of serine and threonine and the imidazole function of histidine are not affected.

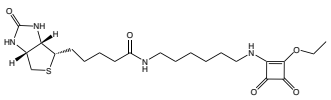
Product details

RL-8430 Biotin-Hx-SQA

N-(6-((2-ethoxy-3,4-dioxocyclobut-1-en-1-yl)amino)hexyl)-5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamide

Formula $C_{22}H_{34}N_4O_5S$

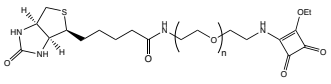
Mol. weight 466,60 g/mol



PEG6590 Biotin-PEG-SQA (3 kDa)

alpha-Biotin-omega-squaric acid ethyl ester poly(ethylene glycol)

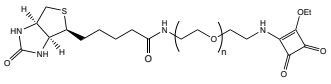
Mol. weight 3000 Da



PEG6595 Biotin-PEG-SQA (5 kDa)

alpha-Biotin-omega-squaric acid ethyl ester poly(ethylene glycol)

Mol. weight 5000 Da

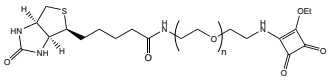


Product details

PEG6580 Biotin-PEG-SQA (10 kDa)

alpha-Biotin-omega-squaric acid ethyl ester poly(ethylene glycol)

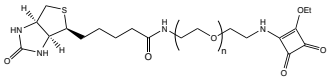
Mol. weight 10000 Da



PEG6585 Biotin-PEG-SQA (20 kDa)

alpha-Biotin-omega-squaric acid ethyl ester poly(ethylene glycol)

Mol. weight 20000 Da



References:

→ *Synthesis and reactivity of compounds with cyclobutane ring(s). 10. Syntheses of squaric acid, its monoorthoesters, and related derivatives via [2 + 2] cycloadditions of tetraalkoxyethylenes with heterosubstituted ketenes; D. Bellus;* ***J. Org. Chem.*** *2002;* ***44****: 1208-1211.* https://doi.org/10.1021/jo01322a004

→ *Be squared: expanding the horizon of squaric acid-mediated conjugations; F. R. Wurm, H. A. Klok;* ***Chem Soc Rev*** *2013;* ***42****: 8220-36.* https://doi.org/10.1039/c3cs60153f

Biotin-PABA is a carboxylic acid terminated biotin derivative and as such amine reactive for chemical biotinylations of amino functions, e.g., of lysines. Its main use is as a substrate for biotinidase, which cleaves biotin-amide to release biotin *in vivo*. As byproduct, *para*-amino benzoic acid is released, which can be quantified by either fluorescent or colorimetric methods.

Product details

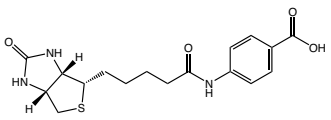
LS-4200 Biotin-PABA

4-(5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamido)benzoic acid

CAS-No. 6929-40-4

Formula $C_{17}H_{21}N_3O_4S$

Mol. weight 363,43 g/mol



Reference:

→ *Qualitative colorimetric ultramicroassay for the detection of biotinidase deficiency in newborns; E. C. Gonzalez, N. Marrero, A. Frometa, D. Herrera, E. Castells, P. L. Perez;* ***Clin Chim Acta*** *2006;* ***369****: 35-9.* https://doi.org/10.1016/j.cca.2006.01.009

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3. Carboxy-Reactive Biotinylation Reagents

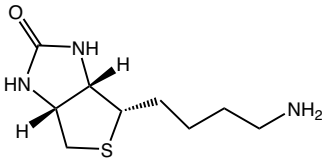
Carboxy groups are present on aspartic acid and glutamate side-chains, as well as on the carboxyterminal ends, and can be reacted with amino-bearing biotinylation reagents in the presence of a coupling reagent, e.g., EDC.

Product details

RL-8435 Norbiotinamine*HCl

(3aS,4S,6aR)-4-(4-aminobutyl)tetrahydro-1H-thieno[3,4-d]imidazol-2(3H)-one hydrochloride

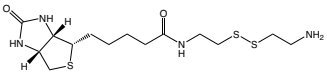
CAS-No.	160385-86-4
Formula	$C_9H_{17}N_3OS*HCl$
Mol. weight	215,32*36,45 g/mol



RL-3391 Biotin-cystamine*TFA

Biotinamidoethyldisulfanyl(2-aminoethane) trifluoroacetate

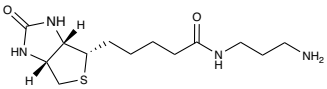
CAS-No.	880491-09-8
Formula	$C_{14}H_{26}N_4O_2S_3*CF_3COOH$
Mol. weight	378,58*114,02 g/mol



LS-1690 Biotinyl-DAPr*TFA

N-(+)-Biotinyl-3-aminopropylammonium trifluoroacetate

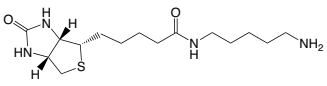
CAS-No.	244760-26-7
Formula	$C_{13}H_{24}N_4O_2S*CF_3CO_2H$
Mol. weight	300,42*114,02 g/mol



RL-2030 Biotin cadaverine nTFA

5-(Biotinamido)pentylamine nTFA

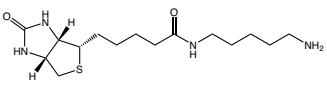
CAS-No.	288259-39-2
Formula	$C_{15}H_{28}N_4O_2S\ nC_2HF_3O_2$
Mol. weight	328,47 net g/mol



LS-1670 Biotinyl cadaverine

N-(5-aminopentyl)biotinamide

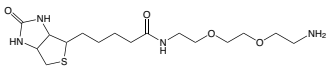
CAS-No.	115416-38-1
Formula	$C_{15}H_{28}N_4O_2S$
Mol. weight	328,48 g/mol



PEG2760 Biotin-DOOA*HCl

1-Biotinyl-3,6-dioxa-8-octaneamine hydrochloride

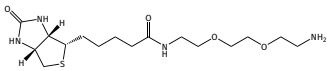
CAS-No. 862373-14-6
Formula $C_{16}H_{30}N_4O_4S*HCl$
Mol. weight 374,50*36,45 g/mol



RL-4060 Biotin-DOOA

Biotinyl-1-amino-3,6-dioxa-8-octanamine

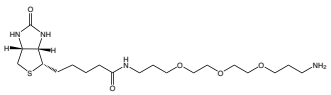
CAS-No. 138529-46-1
Formula $C_{16}H_{30}N_4O_4S$
Mol. weight 374,50 g/mol



PEG8050 Biotin-TOTA

N-(13-amino-4,7,10-trioxatridecanyl)-D-biotinamide

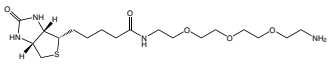
CAS-No. 183896-00-6
Formula $C_{20}H_{38}N_4O_5S$
Mol. weight 446,6 g/mol



RL-4210 Biotin-PEG(3)-NH_2

N-[2-[2-[2-(2-Aminoethoxy)ethoxy]ethoxy]ethyl]biotin-amide

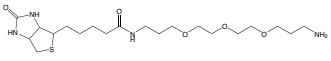
CAS-No. 359860-27-8
Formula $C_{18}H_{34}N_4O_5S$
Mol. weight 418,22 g/mol



PEG2110 Biotin-PEG(3)-NH_2*TFA

N-Biotin-3,3'-(2,2'-oxybis(ethane-2,1-diyl)bis(oxy)) dipropan-1-amine trifluoroacetate

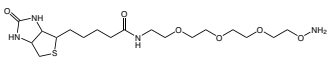
CAS-No. 1334172-59-6
Formula $C_{20}H_{38}N_4O_5S*CF_2CO_2H$
Mol. weight 446,60*114,01 g/mol



PEG5140 Biotin-TEG-O-NH_2*HCl

N-(2-(2-(2-(2-(aminooxy)ethoxy)ethoxy)ethoxy) ethyl)-5-biotinamide hydrochloride

CAS-No. 1951424-88-6
Formula $C_{18}H_{34}N_4O_6S*HCl$
Mol. weight 434,55*36,45 g/mol



Background
Amine-Reactive Biotinylation Reagents
Carboxy-Reactive Biotinylation Reagents
Reagents for Various Protein and RNA Biotinylations
Reversible Biotinylation
Sulfhydryl-Reactive Biotinylation Reagents
Click-Reactive Biotinylation Reagents
Biotinylated Amino Acids
Other Biotin Reagents
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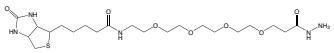
Biotinylation Reagents

Product details

PEG1425 Biotin-PEG(4)-$NHNH_2$

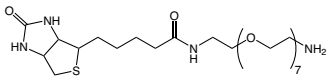
15-Biotinamino-4,7,10,13-tetraoxa-pentadecanoyl hydrazide



CAS-No.	756525-97-0
Formula	$C_{21}H_{39}N_5O_7S$
Mol. weight	505,63 g/mol

PEG4290 Biotin-PEG(7)-NH_2

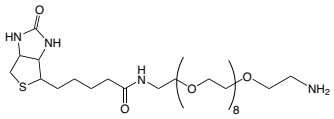
alpha-Biotin-omega-amino hepta(ethylene glycol)



CAS-No.	1334172-76-7
Formula	$C_{26}H_{50}N_4O_9S$
Mol. weight	594,76 g/mol

PEG1044 Biotin-PEG(9)-NH_2

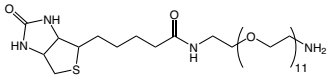
alpha-Biotin-omega-amino-nona(ethylene glycol)



CAS-No.	960132-48-3
Formula	$C_{30}H_{58}N_4O_{11}S$
Mol. weight	682,88 g/mol

PEG4300 Biotin-PEG(11)-NH_2

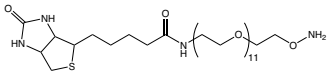
alpha-Biotin-omega-amino undeca(ethylene glycol)



CAS-No.	604786-74-5
Formula	$C_{34}H_{66}N_4O_{13}S$
Mol. weight	770,97 g/mol

PEG4680 Biotin-PEG(11)-O-NH_2*HCl

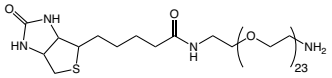
alpha-Biotinyl-omega-oxyamine-undeca(ethylene glycol) hydrochloride



Formula	$C_{34}H_{66}N_4O_{14}S$
Mol. weight	786,97*36,45 g/mol

PEG4310 Biotin-PEG(23)-NH_2

alpha-Biotin-omega-amino 23(ethylene glycol)



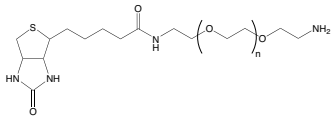
CAS-No.	604786-74-5
Formula	$C_{58}H_{114}N_4O_{25}S$
Mol. weight	1299,6 g/mol

Product details

PEG1046 Biotin-PEG-NH_2 (3 kDa)

alpha-Biotin-omega-amino poly(ethylene glycol)

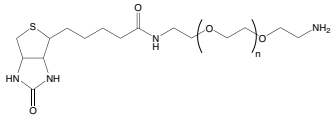
CAS-No. 604786-74-5
Mol. weight 3000 Da



PEG1047 Biotin-PEG-NH_2 (5 kDa)

alpha-Biotin-omega-amino poly(ethylene glycol)

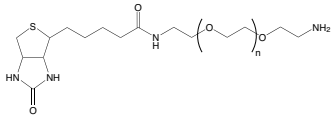
CAS-No. 604786-74-5
Mol. weight 5000 Da



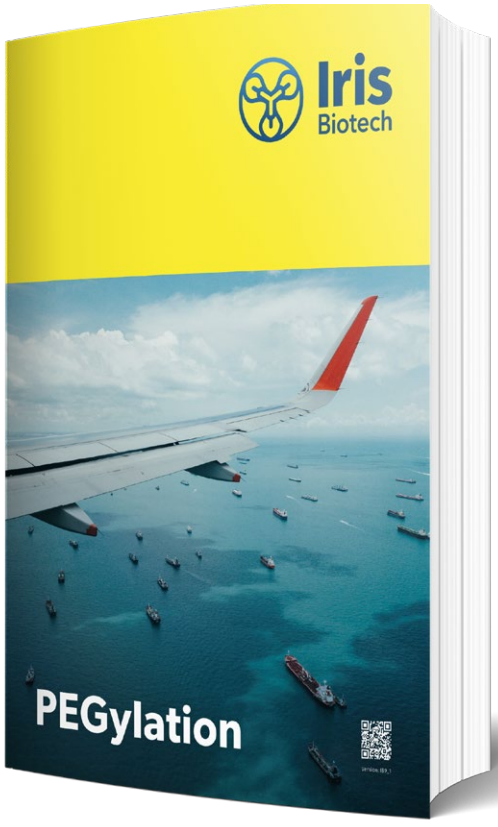
PEG1045 Biotin-PEG-NH_2 (10 kDa)

alpha-Biotin-omega-amino poly(ethylene glycol)

CAS-No. 604786-74-5
Mol. weight 10000 Da



Find more information and background on PEGylation in our booklet PEGylation!



Background
Amine-Reactive Biotinylation Reagents
Carboxy-Reactive Biotinylation Reagents
Reagents for Various Protein and RNA Biotinylations
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4. Reagents for Various Protein and RNA Biotinylations

Tyramine Derivatives

Tyramine derivatives such as biotin-tyramide are converted to radicals by horseradish peroxidase (HRP) in the presence of H_2O_2. These highly reactive species preferentially react with tyrosine residues of proteins, a property that is employed in many applications such as protein labeling, *in situ* hybridization, electron microscopy, ELISA, phage display, and others. Biotin-tyramide is a valuable tool for signal amplification and can significantly improve signal-to-noise ratios.

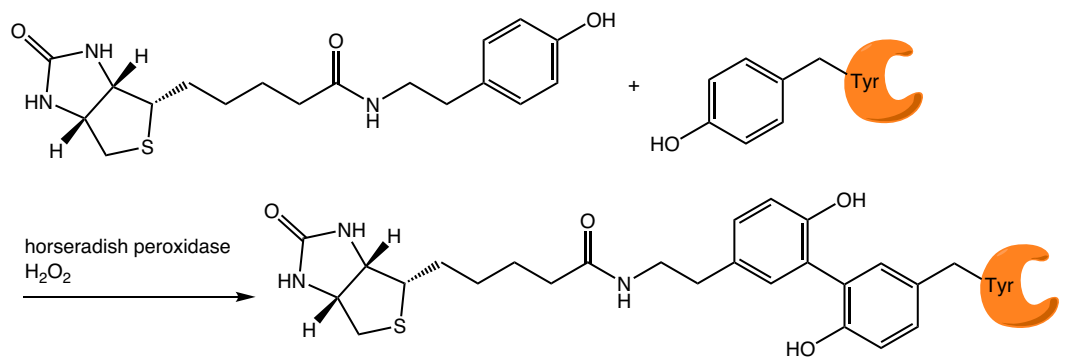
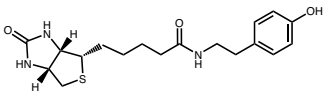


Fig. 4: Selective biotinylation of proteins at the position of tyrosine with biotin-tyramide.

Product details

LS-3500 Biotin Tyramide

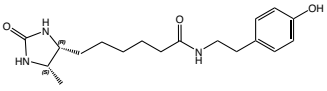
(3aS,4S,6aR)-hexahydro-N-[2-(4-hydroxyphenyl)ethyl]-2-oxo-1H-thieno[3,4-d]imidazole-4-pentanamide



CAS-No.	41994-02-9
Formula	$C_{18}H_{25}N_3O_3S$
Mol. weight	363,47 g/mol

LS-1660 Desthiobiotin-Tyramide

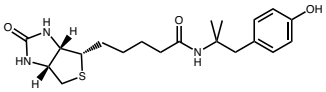
N-(4-hydroxyphenethyl)-6-((4R,5S)-5-methyl-2-oxoimidazolidin-4-yl)hexanamide



CAS-No.	2242902-55-0
Formula	$C_{18}H_{27}N_3O_3$
Mol. weight	333,43 g/mol

LS-4060 Biotin-Dimethyl-Tyramide

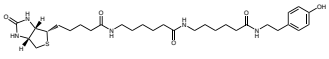
N-(1-(4-hydroxyphenyl)-2-methylpropan-2-yl)-5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamide



CAS-No.	2808072-95-7
Formula	$C_{20}H_{29}N_3O_3S$
Mol. weight	391,53 g/mol

LS-4030 Biotin-Ahx-Ahx-Tyramide

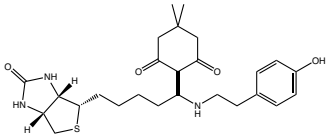
Biotin-Ahx-Ahx-Tyramide



CAS-No.	851113-28-5
Formula	$C_{30}H_{47}N_5O_5S$
Mol. weight	589,8 g/mol

LS-4000 Biotin-Dde-Tyramide

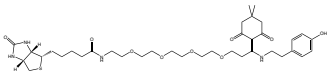
2-(1-(4-hydroxyphenethylamino)-5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentylidene)-5,5-dimethylcyclohexane-1,3-dione



CAS-No.	2819732-80-2
Formula	$C_{26}H_{35}N_3O_4S$
Mol. weight	485,64 g/mol

PEG8130 Biotin-PEG(4)-Dde-Tyramide

N-(15-(4,4-dimethyl-2,6-dioxocyclohexylidene)-18-(4-hydroxyphenyl)-3,6,9,12-tetraoxa-16-azaoctadecyl)-5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamide



CAS-No.	2814457-48-0
Formula	$C_{34}H_{56}N_4O_9S$
Mol. weight	732,93 g/mol

References:

- *New insights into the DT40 B cell receptor cluster using a proteomic proximity labeling assay; X. W. Li, J. S. Rees, P. Xue, H. Zhang, S. W. Hamaia, B. Sanderson, P. E. Funk, R. W. Farndale, K. S. Lilley, S. Perrett,A. P. Jackson;* ***J Biol Chem*** *2014;* ***289****: 14434-47.* https://doi.org/10.1074/jbc.M113.529578
- *Tyramide signal amplification for analysis of kinase activity by intracellular flow cytometry; M. R. Clutter, G. C. Heffner, P. O. Krutzik, K. L. Sachen, G. P. Nolan;* ***Cytometry A*** *2010;* ***77****: 1020-31.* https://doi.org/10.1002/cyto.a.20970
- *Proteomic mapping of mitochondria in living cells via spatially restricted enzymatic tagging; H. W. Rhee, P. Zou, N. D. Udeshi, J. D. Martell, V. K. Mootha, S. A. Carr, A. Y. Ting;* ***Science*** *2013;* ***339****: 1328-1331.* https://doi.org/10.1126/science.1230593
- *A catalysis-based selection for peroxidase antibodies with increased activity; J. Yin, J. H. Mills, P. G. Schultz;* ***J Am Chem Soc*** *2004;* ***126****: 3006-7.* https://doi.org/10.1021/ja0391980
- *Catalyzed reporter deposition, a novel method of signal amplification. II. Application to membrane immunoassays; M. N. Bobrow, K. J. Shaughnessy, G. J. Litt;* ***J Immunol Methods*** *1991;* ***137****: 103-12.* https://doi.org/10.1016/0022-1759(91)90399-z

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- *Catalyzed reporter deposition, a novel method of signal amplification. Application to immunoassays; M. N. Bobrow, T. D. Harris, K. J. Shaughnessy, G. J. Litt;* ***J Immunol Methods*** *1989;* ***125****: 279-85. https://doi.org/10.1016/0022-1759(89)90104-x*
- *The Oxidation of Tyramine, Tyrosine, and Related Compounds by Peroxidase; A. J. Gross, I. W. Sizer;* ***J. Biol. Chem.*** *1959;* ***234****: 1611-1614.*
- *WO2008128352 A1.*

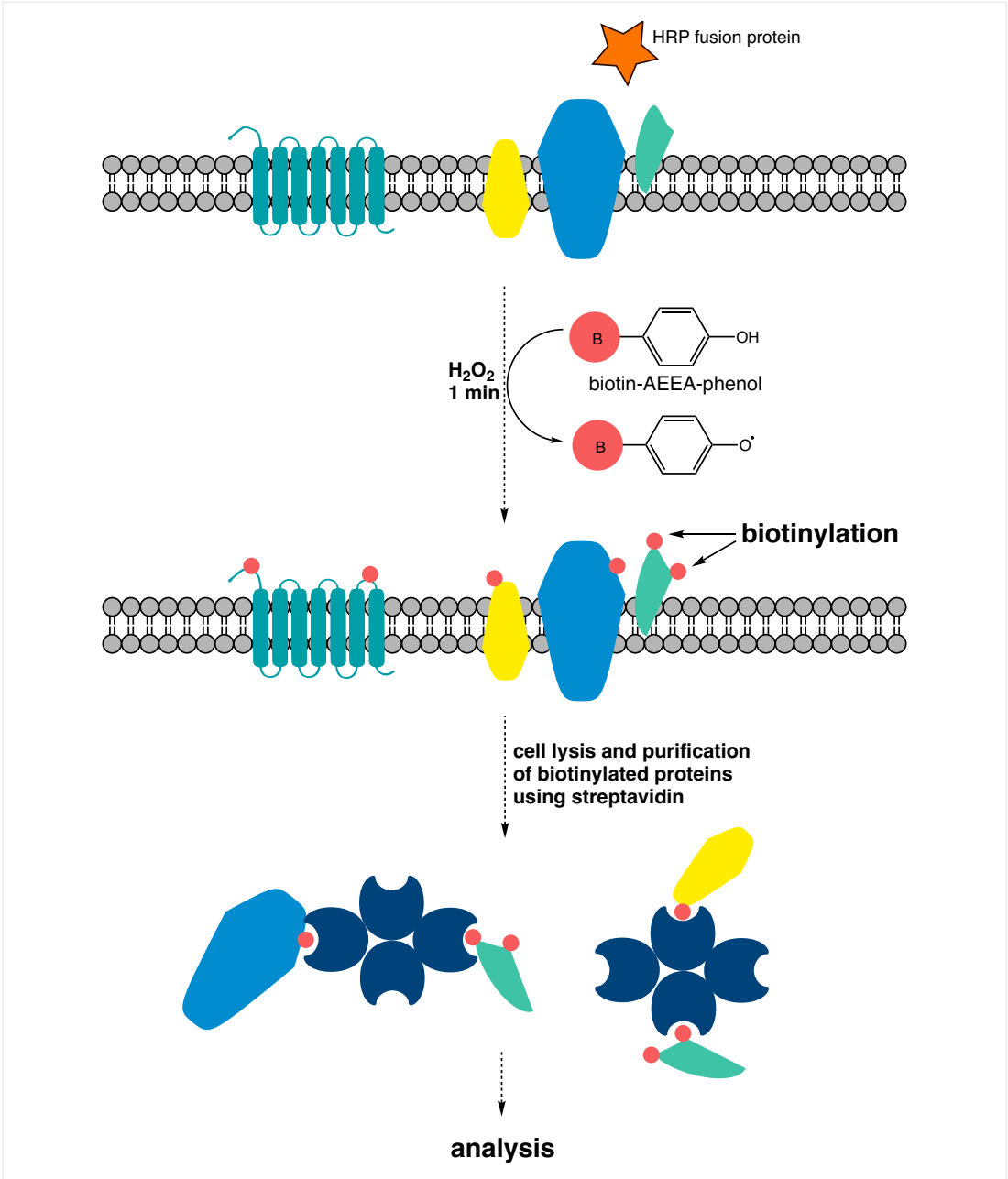
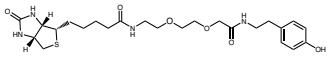


Fig. 5: Principle of proximity labeling of cell-surface proteins with biotin-AEEA-tyramide.

Hydrophilic biotin-AEEA-tyramide, which bears a short PEG spacer between the biotin and the phenol moieties, is shown to be a membrane-impermeant variant of regular biotin-tyramide when used for a short time on cultured cells (ca. 1 min during the biotinylation reaction). Biotin-AEEA-tyramide can thus be used for the selective biotinylation of cell surface proteins.

LS-3490 Biotin-AEEA-Tyramide

N-(2-(2-(2-(4-hydroxyphenethylamino)-2-oxoethoxy) ethoxy)ethyl)-5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamide



CAS-No.	2561473-92-3
Formula	$C_{24}H_{36}N_4O_6S$
Mol. weight	508,63 g/mol

Reference:

→ *Mapping the Proteome of the Synaptic Cleft through Proximity Labeling Reveals New Cleft Proteins; T. Cijsouw, A. Ramsey, T. Lam, B. Carbone, T. Blanpied, T. Biederer;* ***Proteomes*** *2018;* ***6****: 48.*
https://doi.org/10.3390/proteomes6040048

Proximity labeling of proteins with biotin-phenol (biotin-tyramide) and an engineered peroxidase enzyme (e.g., APEX = Engineered Ascorbate Peroxidase) is a pivotal tool for molecular biology. So far, mainly phenolic compounds have been used as substrates for APEX enzymes. The enzymatic reaction yields phenoxyl radicals that predominantly react with electron-rich amino acid side-chains. Consequently, phenolic compounds conjugated to biotin are not ideal for the biotinylation of nucleic acids. In order to facilitate the efficient labeling of nucleic acids, arylamine-biotin conjugates were developed (Zhou *et al.*, Angew. Chem. Int. Ed. 2019). These novel probes show a significantly higher reactivity towards nucleic acids compared to biotin-phenol. In combination with the peroxidase APEX2, these probes allow for the mapping of the subcellular transcriptome by proximity-dependent labeling in living cells, and may aid in elucidating the subcellular organization of biomolecules. When combined with RNA sequencing (APEX-seq), this labeling method provides complete sequence information for various classes of RNA with a high spatiotemporal resolution (Fazal & Han *et al.*, Cell 2019).

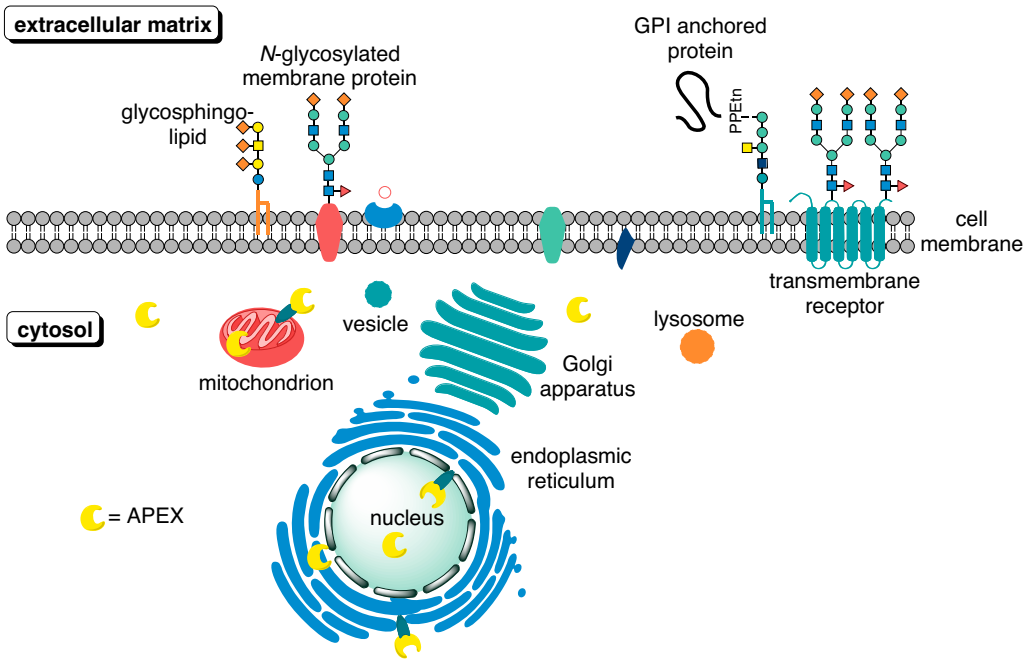


Fig. 6: APEX2 can be genetically coded to the cellular region of interest, where biotin-aniline allows for a biotinylation of RNA with high spatiotemporal resolution.

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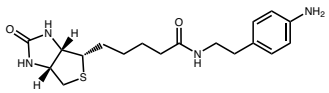
Product details

LS-3970 Biotin-aniline

N-(4-aminophenethyl)-biotinamide

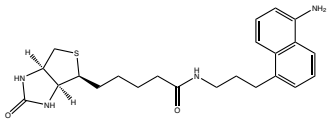
CAS-No.	769933-15-5
Formula	$C_{18}H_{26}N_4O_2S$
Mol. weight	362,49 g/mol



LS-4650 Biotin-naphthylamine

N-(3-(5-aminonaphthalen-1-yl)propyl)-D-biotinamide

CAS-No.	2375201-60-6
Formula	$C_{23}H_{30}N_4O_2S$
Mol. weight	426,58 g/mol



References:

- *Expanding APEX2 Substrates for Proximity-Dependent Labeling of Nucleic Acids and Proteins in Living Cells; Y. Zhou, G. Wang, P. Wang, Z. Li, T. Yue, J. Wang, P. Zou;* ***Angew Chem Int Ed*** *2019;* ***58****: 11763-11767. https://doi.org/10.1002/anie.201905949*
- *Atlas of Subcellular RNA Localization Revealed by APEX-Seq; F. M. Fazal, S. Han, K. R. Parker, P. Kaewsapsak, J. Xu, A. N. Boettiger, H. Y. Chang, A. Y. Ting;* ***Cell*** *2019;* ***178****: 473-490 e26. https://doi.org/10.1016/j.cell.2019.05.027*
- *Directed evolution of APEX2 for electron microscopy and proximity labeling; S. S. Lam, J. D. Martell, K. J. Kamer, T. J. Deerinck, M. H. Ellisman, V. K. Mootha, A. Y. Ting;* ***Nat Methods*** *2015;* ***12****: 51-4. https://doi.org/10.1038/nmeth.3179*

SNAP-tag® and CLIP-tag™

Biotin-conjugated benzylguanine (BG) reacts specifically and rapidly with the so-called SNAP-tag®, a polypeptide protein tag, allowing irreversible and covalent labeling of SNAP fusion proteins with biotin. Biotinylated proteins can for example be selectively isolated based on the high affinity towards (strept) avidin representing a useful tool for purification, immobilization, and labeling.

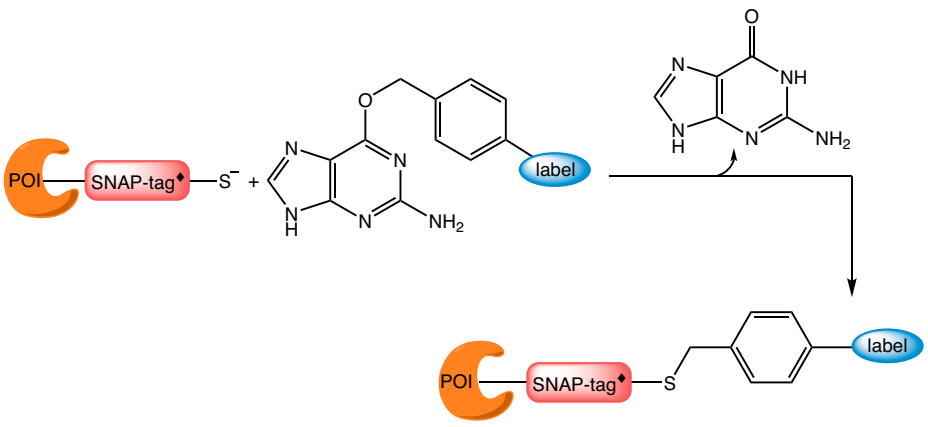
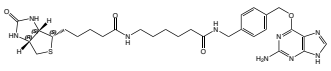


Fig. 7: The SNAP-tag® is a 20 kDa self-labeling protein tag based on a modified form of the human O6-alkyl-guanine-DNA-alkyltransferase (hAGT), a DNA repair enzyme. A cysteine residue within the SNAP-tag® undergoes an irreversible reaction with synthetic O6-benzylguanine (BG) derivatives resulting in a covalent thioether bond. The BG moiety can easily be further functionalized with a label of choice, e.g., fluorophore, biotin, generally without affecting the reaction of the substrate with the SNAP-tag®.

RL-3860 Biotin-SNAP

N-(4-(((2-amino-9H-purin-6-yl)oxy)methyl)benzyl)-6-(5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamido)hexanamide



CAS-No.	471918-16-8
Formula	$C_{29}H_{39}N_9O_4S$
Mol. weight	609,75 g/mol

References:

- *SNAP-Tag Technology: A Useful Tool To Determine Affinity Constants and Other Functional Parameters of Novel Antibody Fragments; J. Niesen, M. Sack, M. Seidel, R. Fendel, S. Barth, R. Fischer, C. Stein;* ***Bioconjug Chem*** *2016;* ***27****: 1931-41.* https://doi.org/10.1021/acs.bioconjchem.6b00315
- *Site-specific, covalent labeling of recombinant antibody fragments via fusion to an engineered version of 6-O-alkylguanine DNA alkyltransferase; F. Kampmeier, M. Ribbert, T. Nachreiner, S. Dembski, F. Beaufils, A. Brecht, S. Barth;* ***Bioconjug Chem*** *2009;* ***20****: 1010-5.* https://doi.org/10.1021/bc9000257
- *A general method for the covalent labeling of fusion proteins with small molecules in vivo; A. Keppler, S. Gendreizig, T. Gronemeyer, H. Pick, H. Vogel, K. Johnsson;* ***Nat Biotechnol*** *2003;* ***21****: 86-9.* https://doi.org/10.1038/nbt765
- *Directed Evolution of O6-Alkylguanine-DNA Alkyltransferase for Efficient Labeling of Fusion Proteins with Small Molecules In Vivo; A. Juillerat, T. Gronemeyer, A. Keppler, S. Gendreizig, H. Pick, H. Vogel, K. Johnsson;* ***Chem. Biol.*** *2003;* ***10****: 313-317.* https://doi.org/10.1016/s1074-5521(03)00068-1

Biotin-conjugated benzylcytosine (BC) reacts specifically and rapidly with the so-called CLIP-tag™, a polypeptide protein tag, allowing irreversible and covalent labeling of clip fusion proteins with biotin. Biotinylated proteins can for example be selectively isolated based on the high affinity towards (strept) avidin representing a useful tool for purification, immobilization, and labeling.

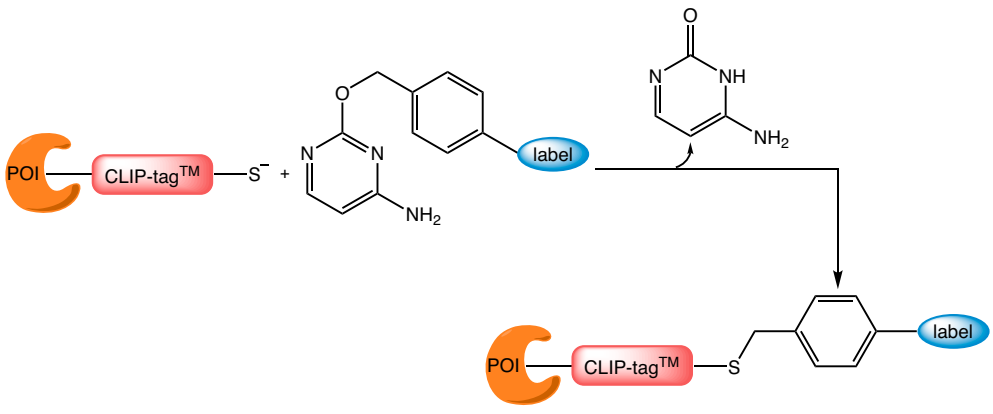


Fig. 8: The CLIP-tag™ (20 kDa) is a modified version of the SNAP-tag®, engineered to react with benzylcytosine (BC) instead of benzylguanine (BG). Thus, properties are similar. CLIP-tag™- and SNAP-tag®-fused proteins can be labeled simultaneously in the same cells.

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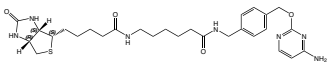
Product details

RL-3870 Biotin-Clip

N-(4-(((4-aminopyrimidin-2-yl)oxy)methyl)benzyl)-6-(5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamido)hexanamide



CAS-No.	1004524-73-5
Formula	$C_{28}H_{39}N_7O_4S$
Mol. weight	569,73 g/mol

Reference:

→ *A general method for the covalent labeling of fusion proteins with small molecules in vivo; A. Keppler, S. Gendreizig, T. Gronemeyer, H. Pick, H. Vogel, K. Johnsson;* ***Nat Biotechnol*** *2003;* ***21****: 86-9.* *https://doi.org/10.1038/nbt765*

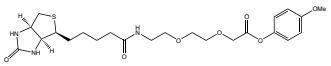
His-tag

This 4-methoxyphenyl ester adds selectively to Gly-His-tags of proteins, while it does not react with amino functions of surface accessible lysines. Therefore, it expresses a unique possibility to label proteins regiospecifically at the Gly-His-tag position, enabling a wide application field in chemical biology and for biopharmaceuticals.

Product details

RL-3100 Biotin-AEEA-OPhOMe

2-(2-(2-(Biotinamido)ethoxy)ethoxy)acetic acid 4-methoxyphenyl ester



CAS-No.	2546513-67-9
Formula	$C_{23}H_{33}N_3O_7S$
Mol. weight	495,59 g/mol

For more details about the methodology for highly selective N-terminal chemical acylation of expressed proteins, please look at our blog at: *www.iris-biotech.de/blog/potm-his-tags-for-the-chemical-modification-of-peptides/*

References:

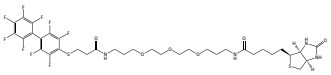
→ *Selective N-terminal acylation of peptides and proteins with a Gly-His tag sequence; M. C. Martos-Maldonado, C. T. Hjuler, K. K. Sorensen, M. B. Thygesen, J. E. Rasmussen, K. Villadsen, S. R. Midtgaard, S. Kol, S. Schoffelen, K. J. Jensen;* ***Nat Commun*** *2018;* ***9****: 3307.* *https://doi.org/10.1038/s41467-018-05695-3*

→ *Selective Acylation of Proteins at Gly and Lys in His Tags; K. J. Jensen, M. B. Thygesen, K. K. Sørensen, S. Wu, T. Treiberg, S. Schoffelen;* ***ChemBioChem*** *2022;* ***23(24)****: e202200359.* *https://doi.org/10.1002/cbic.202200359*

Another way for site-selective conjugation is the so-called π-Clamp-mediated cysteine conjugation. Pentelute and co-workers showed that the incorporation of the four-amino-acid sequence Phe-Cys-Pro-Phe, the so-called „π-Clamp“, tunes the reactivity of this cysteine thiol for site-selective conjugation with perfluoroaromatic reagents. Thus, this technology can be used to selectively modify one cysteine site in proteins containing multiple endogenous cysteine residues.

RL-4050 PFB-mercaptopropionyl-TOTA-Biotin

Perfluorobiphenyl-mercaptopropionyl-TOTA-Biotin



Formula	$C_{35}H_{41}F_9N_4O_6S_2$
Mol. weight	848,84 g/mol

References:

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- *Convergent diversity-oriented side-chain macrocyclization scan for unprotected polypeptides; Y. Zou, A. M. Spokoyny, C. Zhang, M. D. Simon, H. Yu, Y.-S. Lin, B. L. Pentelute;* ***Org. Biomol. Chem.*** *2014;* ***12****: 566-573. https://doi.org/10.1039/C3OB42168F*
- *π-Clamp-mediated cysteine conjugation; C. Zhang, M. Welborn, T. Zhu, N. J. Yang, M. S. Santos, T. Van Voorhis, B. L. Pentelute;* ***Nat Chem.*** *2016;* ***8****: 120-128. https://doi.org/10.1038/nchem.2413*
- *Site-Specific Small Molecule Labeling of an Internal Loop in JC Polyomavirus Pentamers Using the π-Clamp-Mediated Cysteine Conjugation; J. A. Baccile, P. J. Voorhees, A. J. Chillo, M. Berry, R. Morgenstern, T. J. Schwertfeger, F. M. Rossi, C. D. S. Nelson;* ***ChemBioChem*** *2022;* ***(21)****: 3037-3041. https://doi.org/10.1002/cbic.202100188*

CBT Derivatives

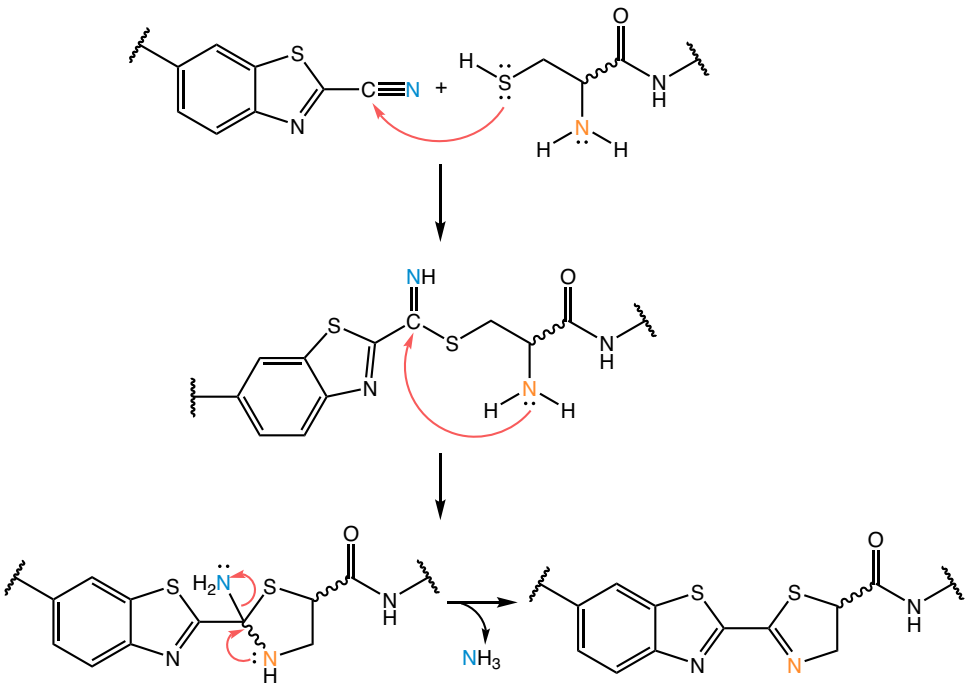

Fig. 9: Mechanism of the CBT-Click reaction: The electron pair of the sulfur attacks the carbon of the cyano group, the nitrogen forms an enamine. The cysteine's nitrogen then attacks the carbon of the enamine, and a cyclic intermediate is formed. Finally, the lone electron pair of the amino nitrogen of the cysteine attacks the positively charged carbon to yield the product. The nitrogen which came from the nitrile is leaving the reaction as ammonia.

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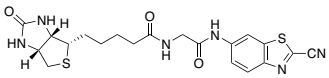
Biotinylation Reagents

Product details

RL-4230 Biotin-Gly-CBT

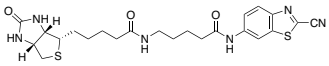
N-(2-((2-cyanobenzo[d]thiazol-6-yl)amino)-2-oxoethyl)-biotin



Formula	$C_{20}H_{22}N_6O_3S_2$
Mol. weight	458,56 g/mol

RL-4240 Biotin-Pen-CBT

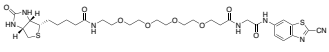
N-(5-((2-cyano-6-benzothiazolyl)amino)-5-oxopentyl)-biotin



CAS-No.	2550397-17-4
Formula	$C_{23}H_{28}N_6O_3S_2$
Mol. weight	500,64 g/mol

RL-4250 Biotin-PEG(4)-Gly-CBT

15-Biotinylamino-4,7,10,13-tetraoxa-pentadecanoyl-glycinyl-N-2-cyano-benzothiazole



CAS-No.	1907639-46-6
Formula	$C_{31}H_{43}N_7O_8S_2$
Mol. weight	705,85 g/mol

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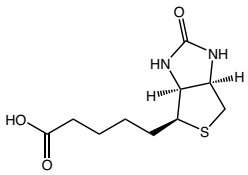
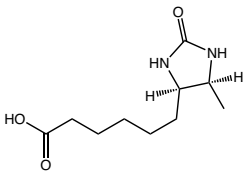
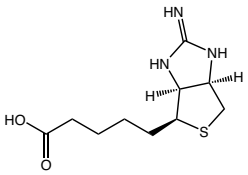
5. Reversible Biotinylation

Competitive Displacement of Desthiobiotin or 2-Iminobiotin by Biotin

The single-ring, sulfur-free desthiobiotin binds to (strept)avidin with almost the same specificity as biotin but has a lower affinity than biotin (K_d=10^{-11} M vs. K_d=10^{-15} M, respectively). Thus, milder elution conditions based on competitive displacement with free biotin are sufficient for the efficient release of desthiobiotinylated proteins from (strept)avidin. In addition, as further advantage, endogenous biotinylated molecules remain bound to (strept)avidin during pull-down assay experiments with biological samples, which allows easy differentiation and prevents co-purification.

In comparison to biotin and desthiobiotin, the guanidino analog of biotin (= 2-iminobiotin) shows an even weaker binding affinity for (strept)avidin, which is, in addition, pH-dependent. At high pH (> 9), iminobiotin-tagged proteins bind to (strept)avidin conjugates with high affinity, but the (strept)avidin–iminobiotin complexes dissociate at low pH (~ 4) or *via* replacement upon addition of biotin. This allows the purification of a captured protein without denaturation, releasing biologically functional, 2-imino-biotinylated-proteins from the (strept)avidin conjugates. Besides, 2-iminobiotin reversibly inhibits nitric oxide synthases (NOS). NOS oxidizes the guanidino-nitrogen of L-arginine, resulting in L-citrulline and nitric oxide.

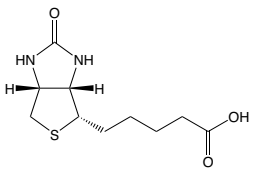
Tab.1: Overview of different biotin derivatives and affinity towards (strept)avidin.

Compound	Biotin	Desthiobiotin	2-Iminobiotin
Structure			
Affinity towards (strept)avidin (K_d)	10^{-15} M	10^{-11} M	10^{-8} M

Product details

LS-1070 D-Biotin

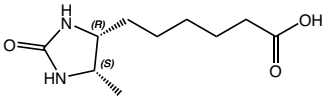
Hexahydro-2-oxo-1H-thieno[3,4-d]imidazole-4-pentanoic acid



CAS-No.	58-85-5
Formula	$C_{10}H_{16}N_2O_3S$
Mol. weight	244,31 g/mol

LS-1650 D-Desthiobiotin

(4R,5S)-5-methyl-2-oxo-4-Imidazolidinehexanoic acid



CAS-No.	533-48-2
Formula	$C_{10}H_{18}N_2O_3$
Mol. weight	214,27 g/mol

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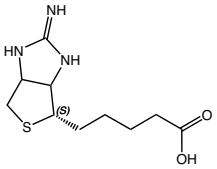
Product details

LS-4320 2-Iminobiotin

5-((4S)-2-iminohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanoic acid

CAS-No.	13395-35-2
Formula	$C_{10}H_{17}N_3O_2S$
Mol. weight	243,32 g/mol



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- *Iminobiotin affinity columns and their application to retrieval of streptavidin; K. Hofmann, S. W. Wood, C. C. Brinton, J. A. Montibeller, F. M. Finn;* ***Proc Natl Acad Sci U S A*** *1980;* ***77****: 4666-8.* https://doi.org/10.1073/pnas.77.8.4666
- *Voltammetric homogeneous binding assay of biotin without a separation step using iminobiotin labeled with an electroactive compound; K. Sugawara, N. Kamiya, G. Hirabayashi, H. Kuramitz;* ***Anal. Sci.*** *2005;* ***21****: 897-900.* https://doi.org/10.2116/analsci.21.897
- *Easily reversible desthiobiotin binding to streptavidin, avidin, and other biotin-binding proteins: uses for protein labeling, detection, and isolation; J. D. Hirsch, L. Eslamizar, B. J. Filanoski, N. Malekzadeh, R. P. Haugland, J. M. Beechem, R. P. Haugland;* ***Anal Biochem*** *2002;* ***308****: 343-57.* https://doi.org/10.1016/s0003-2697(02)00201-4
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Dde-based Linkers

Placing Dde as one terminal group of a linker and a functional group prone for conjugation as the other, or using Dde as the central connective portion of a linker, allows for the creation of new bifunctional and cleavable linkers. Dde can be selectively cleaved by using a buffered, aqueous solution of hydrazine or hydroxylamine, thus cleaving the linkage after (strept)avidin attachment. The cleavage can be monitored spectroscopically, as the resulting pyrazole shows a strong absorption at 290 nm.

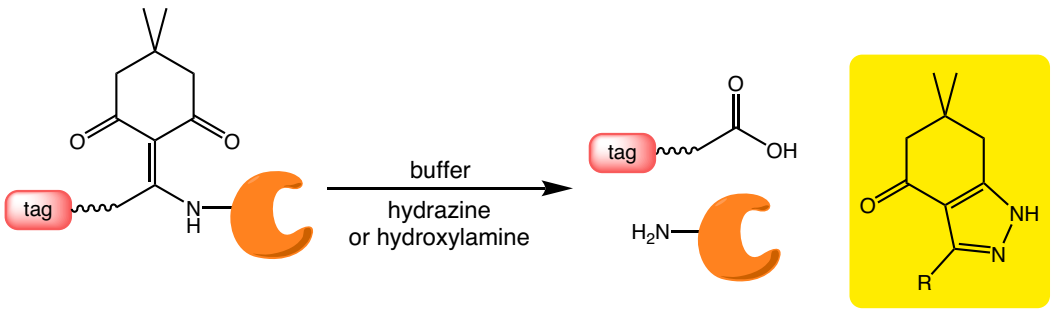
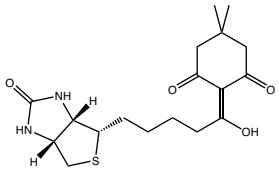


Fig. 10: Cleavage of Dde-based linkers by (buffered) solutions of hydrazine or hydroxylamine can spectroscopically be monitored due to the formation of a chromophoric pyrazole derivative.

LS-4020 Biotin-Dde

2-(1-hydroxy-5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentylidene)-5,5-dimethylcyclohexane-1,3-dione

CAS-No.	194038-08-9
Formula	$C_{18}H_{26}N_2O_4S$
Mol. weight	366,48 g/mol



Dde-based linkers can selectively and temporarily be attached to:

- biomolecules for binding to (strept)avidin (with terminal biotin) (A);
- conjugation to any solid supports, e.g., *via* Click reaction (B);
- solubilizing tags, e.g., hexa-lysine (C) or oligo-arginine;
- PEGs (D) or other hydrophilic groups improving the solubility;
- dyes and any other conjugate for monitoring, diagnostics, targeting or other purposes.

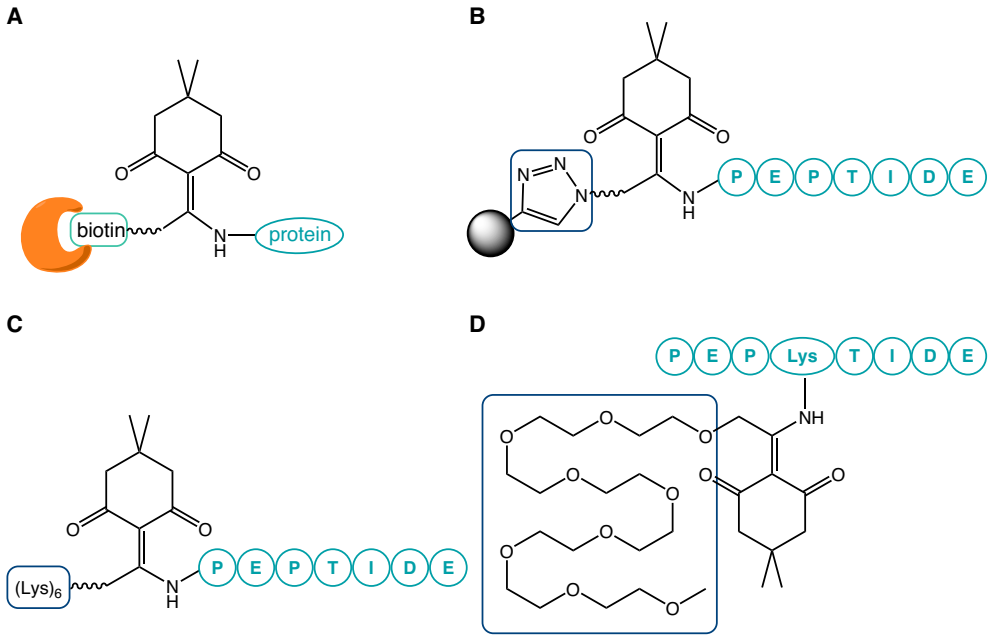


Fig. 11: Dde-based linkers can be utilized for various applications: Attachment of a cleavable biotin tag to proteins for catch-and-release affinity purification over (strept)avidin beads (A), reversible labeling or conjugation to other biomolecules, or reversible immobilization on solid supports via Click chemistry (B), temporary attachment of solubilizing tags like oligo-lysine (C) or PEGs (D).

Dde-based linkers are one option of cleavable linkers with mild cleavage conditions. A different widely applicable methodology is the introduction of disulfides. Biotinylating variants with cleavable linkers based on disulfides can be cleaved using reducing agents such as glutathione. Alternatively, reducing conditions inside certain cell compartments enable specific elution of biotinylated molecules from biotin-binding proteins.

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Biotin-SS-NHS is a disulfide bridge-containing biotinylation construct that can be cleaved using reducing agents such as glutathione or by reducing conditions inside certain cell compartments.

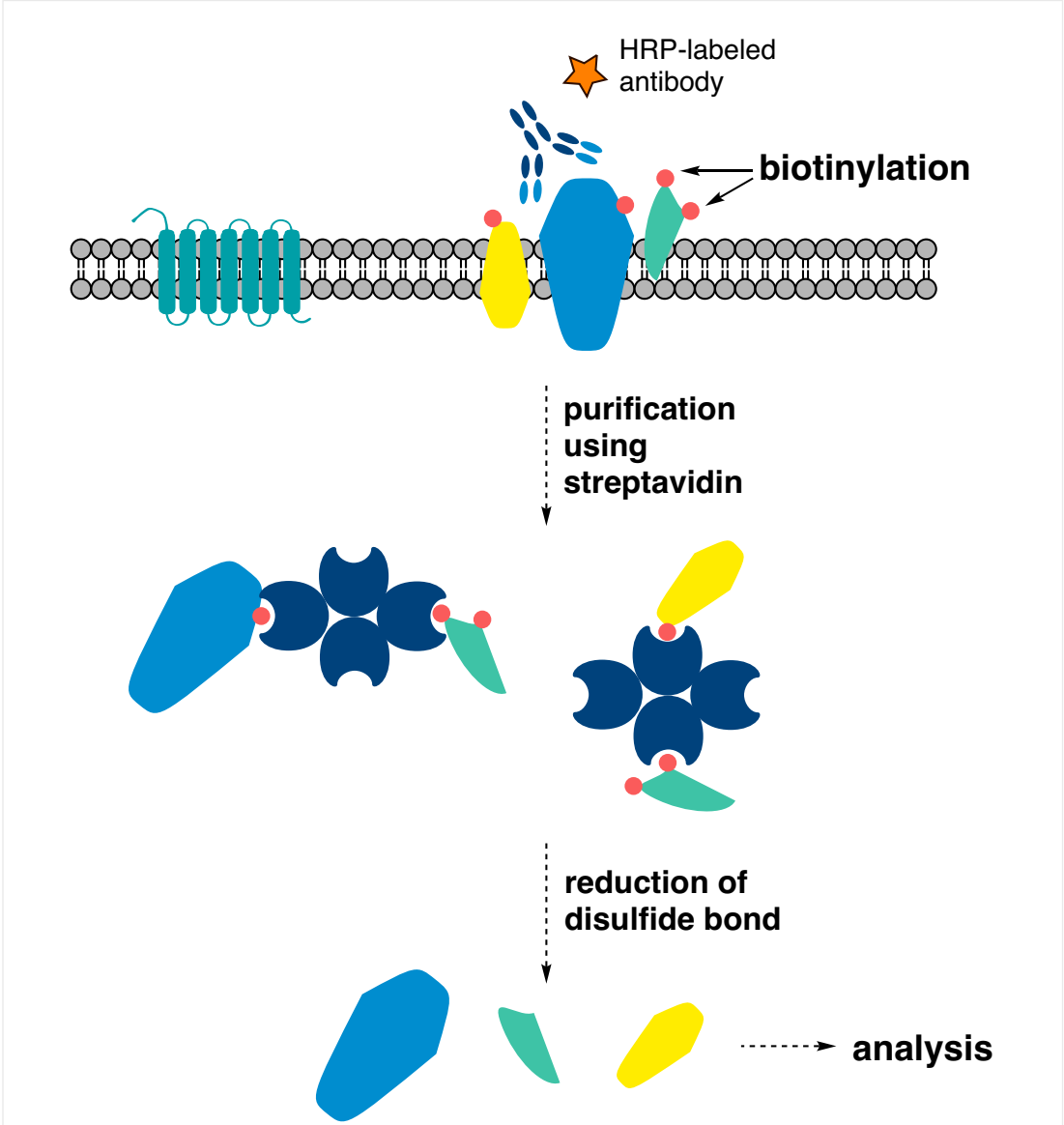
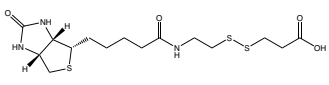


Fig. 12: Targeted biotinylation and purification of cell-surface proteins.

Product details

RL-3300 Biotin-SS-COOH

3-((2-(5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamido)ethyl)disulfanyl)propanoic acid



CAS-No.	104582-29-8
Formula	$C_{15}H_{25}N_3O_4S_3$
Mol. weight	407,57 g/mol

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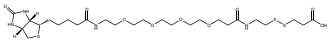
Biotinylation Reagents

Product details

PEG8090 Biotin-PEG(4)-SS-COOH

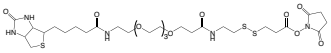
9,25-dioxo-29-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)-12,15,18,21-tetraoxa-4,5-dithia-8,24-diazanonacosan-1-oic acid



CAS-No.	1380166-80-2
Formula	$C_{26}H_{46}N_4O_9S_3$
Mol. weight	654,86 g/mol

PEG1910 Biotin-PEG(4)-S-S-NHS

1-Biotinamino-15-oxo-3,6,9,12-tetraoxa-19,20-dithia-16-azatricosan-23-oic acid succinimidyl ester



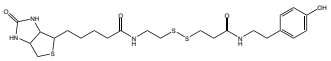
CAS-No.	1260247-51-5
Formula	$C_{30}H_{49}N_5O_{11}S_3$
Mol. weight	751,93 g/mol

Biotin-SS-tyramide is a valuable linker for peroxidase-promoted targeted protein biotinylation and protein clusters on cell surfaces. By using peroxidase-tagged antibodies, proteins and protein clusters can be selectively biotinylated, and then isolated using (strept)avidin. The biotin-tag can be subsequently removed using reducing agents (e.g., glutathione). One possible application of biotin-SS-tyramide is the targeted biotinylation of proteins and protein clusters on cell surfaces using HRP-labeled antibodies. Labeled proteins are then purified by using (strept)avidin and released by reductive cleavage of the linker disulfide bond.

Product details

LS-3570 Biotin-SS-Tyramide

N-(2-((3-(4-hydroxyphenethylamino)-3-oxopropyl) disulfanyl)ethyl)-5-(2-oxohexahydro-1H-thieno[3,4-d] imidazol-4-yl)pentanamide



CAS-No.	678975-20-7
Formula	$C_{23}H_{34}N_4O_4S_3$
Mol. weight	526,74 g/mol

LS-3930 Biotin-PEG(4)-SS-Tyramide

N-(2-((3-(4-hydroxyphenethylamino)-3-oxopropyl)disulfanyl)ethyl)-1-(5-(2-oxohexahydro-1H-thieno[3,4-d] imidazol-4-yl)pentanamido)-3,6,9,12-tetraoxapentadecan-15-amide

Formula	$C_{34}H_{55}N_5O_9S_3$
Mol. weight	774,02 g/mol

References:

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- *A catalysis-based selection for peroxidase antibodies with increased activity; J. Yin, J. H. Mills, P. G. Schultz;* ***J Am Chem Soc*** *2004;* ***126****: 3006-7.* *https://doi.org/10.1021/ja039198o*
- *Easily reversible desthiobiotin binding to streptavidin, avidin, and other biotin-binding proteins: uses for protein labeling, detection, and isolation; J. D. Hirsch, L. Eslamizar, B. J. Filanoski, N. Malekzadeh, R. P. Haugland, J. M. Beechem, R. P. Haugland;* ***Anal Biochem*** *2002;* ***308****: 343-57.* *https://doi.org/10.1016/s0003-2697(02)00201-4*

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6. Sulfhydryl-Reactive Biotinylation Reagents

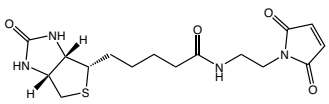
Besides amines, sulfhydryl groups of cysteines are the second most-common targets for biotinylation. Maleimide groups are highly reactive towards sulfhydryl groups at acidic to neutral pH, forming a thioether bond. Alternatively, thiols and pyridyl disulfide-substituted biotin derivatives can be used, resulting in the formation of a cleavable disulfide bond. In the case of using pyridyldisulfides, the biotinylation reaction can visually be monitored by the release of pyridine-2-thione.

Biotin Reagents with Maleimide Function

Product details

LS-4220 Biotin-mal

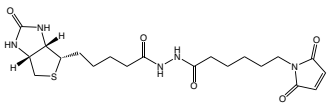
N-(2-(2,5-dioxo-2,5-dihydro-1H-pyrrol-1-yl)ethyl)-5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamide



CAS-No.	139554-72-6
Formula	$C_{16}H_{22}N_4O_4S$
Mol. weight	366,44 g/mol

RL-8420 Biotin-NH-NH-Mal

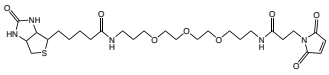
6-(2,5-dioxo-2,5-dihydro-1H-pyrrol-1-yl)-*N'*-(5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanoyl)hexanehydrazide



CAS-No.	116919-18-7
Formula	$C_{20}H_{29}N_5O_5S$
Mol. weight	451,54 g/mol

PEG1605 Biotin-PEG(3)-mal

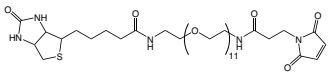
N-(3-(2-(2-(3-(Biotinamino)propoxy)ethoxy)ethoxy)propyl)-3-maleimidylpropanamide



CAS-No.	525573-22-2
Formula	$C_{27}H_{43}N_5O_8S$
Mol. weight	597,72 g/mol

PEG1595 Biotin-PEG(11)-mal

alpha-Biotin-omega-maleimido undeca(ethylene glycol)

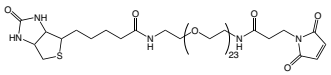


CAS-No.	1334172-60-9
Formula	$C_{41}H_{71}N_5O_{16}S$
Mol. weight	922,09 g/mol

PEG4320 Biotin-PEG(23)-mal

alpha-Biotin-omega-maleimido 23(ethylene glycol)

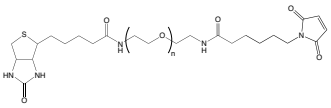
CAS-No. 1334172-60-9
Formula $C_{65}H_{119}N_5O_{28}S$
Mol. weight 1450,72 g/mol



PEG1049 Biotin-PEG-mal (3 kDa)

alpha-Biotin-omega-maleimido poly(ethylene glycol)

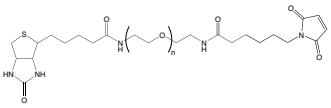
Mol. weight 3000 Da



PEG1050 Biotin-PEG-mal (5 kDa)

alpha-Biotin-omega-maleimido poly(ethylene glycol)

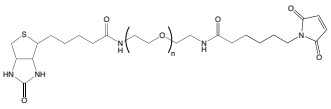
Mol. weight 5000 Da



PEG1048 Biotin-PEG-mal (10 kDa)

alpha-Biotin-omega-maleimido poly(ethylene glycol)

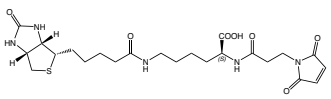
Mol. weight 10000 Da



RL-8425 Biocytin-Mal

N2-(3-(2,5-dioxo-2,5-dihydro-1H-pyrrol-1-yl)propanoyl)-N6-(5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d] imidazol-4-yl)pentanoyl)-L-lysine

CAS-No. 102849-12-7
Formula $C_{23}H_{33}N_5O_7S$
Mol. weight 523,61 g/mol



Background
Amine-Reactive Biotinylation Reagents
Carboxy-Reactive Biotinylation Reagents
Reagents for Various Protein and RNA Biotinylations
Reversible Biotinylation
Sulfhydryl-Reactive Biotinylation Reagents
Click-Reactive Biotinylation Reagents
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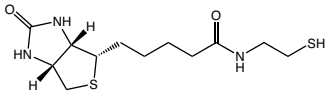
Biotin Reagents with Thiol Function

Product details

LS-4250 Biotin-Cysteamine

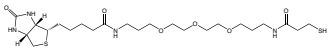
N-(2-mercaptoethyl)-5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamide



CAS-No.	99938-68-8
Formula	$C_{12}H_{21}N_3O_2S_2$
Mol. weight	303,44 g/mol

LS-4260 Biotin-PEG(3)-SH

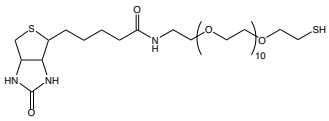
N-(17-mercapto-15-oxo-4,7,10-trioxa-14-azahep-tadecyl)-5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamide



CAS-No.	1208242-09-4
Formula	$C_{23}H_{42}N_4O_6S_2$
Mol. weight	534,73 g/mol

PEG4705 Biotin-PEG(11)-SH

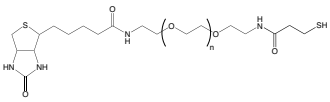
alpha-Biotin-omega-mercapto undeca(ethylene glycol)



CAS-No.	1650579-23-9
Formula	$C_{34}H_{65}N_3O_{13}S_2$
Mol. weight	788,02 g/mol

PEG1213 Biotin-PEG-SH (3 kDa)

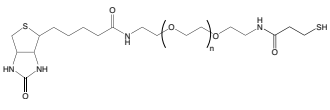
alpha-Biotin-omega-mercapto poly(ethylene glycol)



CAS-No.	1030917-83-9
Mol. weight	3000 Da

PEG1214 Biotin-PEG-SH (5 kDa)

alpha-Biotin-omega-mercapto poly(ethylene glycol)



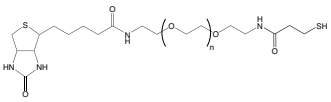
CAS-No.	1030917-83-9
Mol. weight	5000 Da

Product details

PEG1212 Biotin-PEG-SH (10 kDa)

alpha-Biotin-omega-mercapto poly(ethylene glycol)

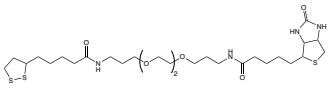
CAS-No. 1030917-83-9
Mol. weight 10000 Da



PEG3570 Lipoamide-PEG(3)-biotin

alpha-Lipoamide-omega-biotinyl tri(ethylene glycol)

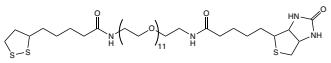
CAS-No. 1334172-74-5
Formula $C_{28}H_{50}N_4O_6S_3$
Mol. weight 634,91 g/mol



PEG3580 Lipoamide-PEG(11)-biotin

alpha-Lipoamide-omega-biotinyl undeca(ethylene glycol)

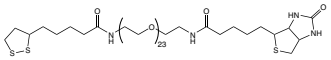
CAS-No. 960069-81-2
Formula $C_{42}H_{78}N_4O_{14}S_3$
Mol. weight 959,28 g/mol



PEG7530 Lipoamide-PEG(23)-biotin

alpha-Lipoamide-omega-biotinyl 23(ethylene glycol)

Formula $C_{66}H_{126}N_4O_{26}S_3$
Mol. weight 1487,91 g/mol



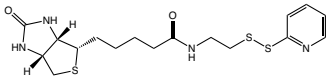
Biotin Reagents with Cleavable Disulfide Unit

Product details

LS-4230 Biotin-SS-Py

5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d] imidazol-4-yl)-N-(2-(pyridin-2-yldisulfaneyl)ethyl) pentanamide

CAS-No. 112247-65-1
Formula $C_{17}H_{24}N_4O_2S_3$
Mol. weight 412,59 g/mol



Background
Amine-Reactive Biotinylation Reagents
Carboxy-Reactive Biotinylation Reagents
Reagents for Various Protein and RNA Biotinylations
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Sulfhydryl-Reactive Biotinylation Reagents
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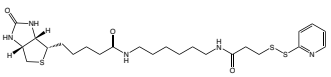
Biotinylation Reagents

Product details

RL-8415 Biotin-Hx-SS-Py

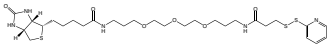
5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)-N-(6-(3-(pyridin-2-yldisulfanyl)propanamido)hexyl)pentanamide



CAS-No.	129179-83-5
Formula	$C_{24}H_{37}N_5O_3S_3$
Mol. weight	539,77 g/mol

LS-4240 Biotin-PEG(3)-SS-Py

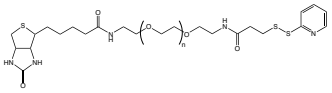
N-(15-oxo-17-(pyridin-2-yldisulfaneyl)-4,7,10-trioxa-14-azaheptadecyl)-5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamide



Formula	$C_{28}H_{45}N_5O_6S_3$
Mol. weight	643,88 g/mol

PEG4770 Biotin-PEG-OPSS (3 kDa)

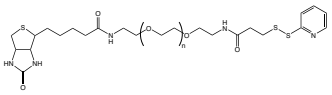
alpha-Biotin-omega-pyridyl-2-disulfid poly(ethylene glycol)



CAS-No.	1776111-43-3
Mol. weight	3000 Da

PEG4775 Biotin-PEG-OPSS (5 kDa)

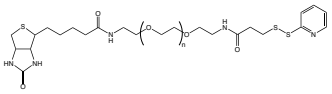
alpha-Biotin-omega-pyridyl-2-disulfid poly(ethylene glycol)



CAS-No.	1776111-43-3
Mol. weight	5000 Da

PEG4780 Biotin-PEG-OPSS (10 kDa)

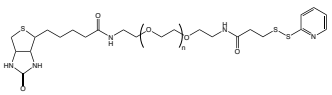
alpha-Biotin-omega-pyridyl-2-disulfid poly(ethylene glycol)



CAS-No.	1776111-43-3
Mol. weight	10000 Da

PEG4785 Biotin-PEG-OPSS (20 kDa)

alpha-Biotin-omega-pyridyl-2-disulfid poly(ethylene glycol)



CAS-No.	1776111-43-3
Mol. weight	20000 Da

7. Click-Reactive Biotinylation Reagents

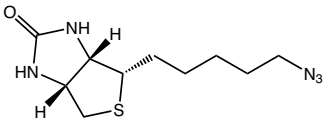
Our portfolio includes azide- as well as alkyne-derivatized biotins suitable for conjugation *via* click chemistry. As further benefit triazole-linked adducts are shown to be highly resistant to the ubiquitous hydrolytic enzyme biotinidase and to bind (strept)avidin with dissociation constants in the low pM range.

Product details

LS-4300 DecarboxyBiotin-N_3

(3aS,4S,6aR)- 4-(5-Azidopentyl)tetrahydro-1H-Thieno[3,4-d]imidazol-2(3H)-one

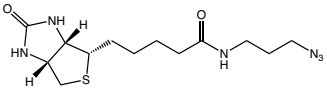
CAS-No.	1260586-88-6
Formula	$C_{10}H_{17}N_5OS$
Mol. weight	255,34 g/mol



LS-4210 Biotin-N_3

N-(3-azidopropyl)-5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamide

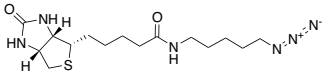
CAS-No.	908007-17-0
Formula	$C_{13}H_{22}N_6O_2S$
Mol. weight	326,42 g/mol



LS-4660 Biotinyl-DAPe-N_3

N-(5-azidopentyl)-5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamide

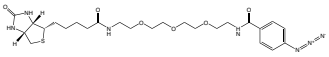
CAS-No.	1349190-76-6
Formula	$C_{15}H_{26}N_6O_2S$
Mol. weight	354,47 g/mol



PEG6795 Biotin-PEG3-Ph(4-N_3)

Biotin-PEG3-phenyl azide

CAS-No.	2088238-77-9
Formula	$C_{25}H_{37}N_7O_6S$
Mol. weight	563,67 g/mol



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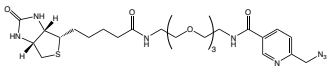
Biotinylation Reagents

Product details

LS-4680 Biotin-PEG(3)-PyAz

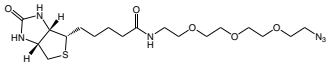
6-(azidomethyl)-N-(13-oxo-17-((3aS,4S,6aR)-2-oxo-hexahydro-1H-thieno[3,4-d]imidazol-4-yl)-3,6,9-trioxa-12-azaheptadecyl)nicotinamide



Formula	$C_{25}H_{38}N_8O_6S$
Mol. weight	578,69 g/mol

PEG4940 Biotin-PEG(3)-N_3

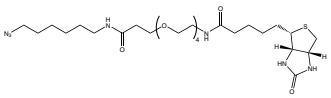
11-[D(+)-Biotinylamino]-1-azido-3,6,9-trioxaundecane



CAS-No.	875770-34-6
Formula	$C_{18}H_{32}N_6O_5S$
Mol. weight	444,55 g/mol

PEG7990 Biotin-PEG(4)-N_3

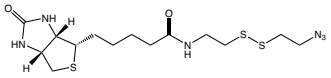
(3aS,4S,6aR)-4-(28-azido-5,21-dioxo-9,12,15,18-tetraoxa-6,22-diazaoctacosyl)tetrahydro-1H-thieno[3,4-d]imidazol-2(3H)-one



CAS-No.	1006592-62-6
Formula	$C_{27}H_{49}N_7O_7S$
Mol. weight	615,79 g/mol

RL-4120 Biotin-SS-N_3

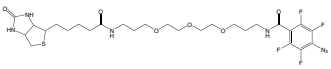
N-(2-((2-azidoethyl)disulfanyl)ethyl)-5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamide



CAS-No.	1620523-64-9
Formula	$C_{14}H_{24}N_6O_2S_3$
Mol. weight	404,57 g/mol

PEG2065 Biotin-TEG-ATFBA

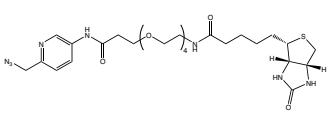
Biotin-triethylenglycol-(*p*-azido-tetrafluorobenzamide)



CAS-No.	1264662-85-2
Formula	$C_{27}H_{37}F_4N_7O_6S$
Mol. weight	663,68 g/mol

PEG8000 Biotin-PEG(4)-Picolyl-N_3

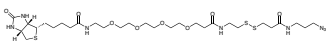
(3aS,4S,6aR)-4-(1-(6-(azidomethyl)pyridin-3-ylamino)-1,17-dioxo-4,7,10,13-tetraoxa-16-azahenicosan-21-yl) tetrahydro-1H-thieno[3,4-d]imidazol-2(3H)-one



CAS-No.	2222687-71-8
Formula	$C_{27}H_{42}N_8O_7S$
Mol. weight	622,74 g/mol

PEG8100 Biotin-PEG(4)-SS-Azide

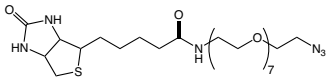
N-(2-((3-((3-azidopropyl)amino)-3-oxopropyl)disulfaneyl)ethyl)-1-(5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamido)-3,6,9,12-tetraoxapentadecan-15-amide



CAS-No.	1260247-52-6
Formula	$C_{29}H_{52}N_8O_8S_3$
Mol. weight	736,96 g/mol

PEG4330 Biotin-PEG(7)-N_3

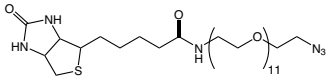
alpha-Biotin-omega-azido hepta(ethylene glycol)



CAS-No.	1334172-75-6
Formula	$C_{26}H_{48}N_6O_9S$
Mol. weight	620,76 g/mol

PEG4340 Biotin-PEG(11)-N_3

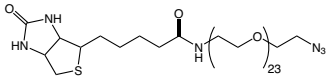
[2-(2-aminoethoxy)ethoxy]acetic acid *tert*-butyl ester*HCl



CAS-No.	956494-20-5
Formula	$C_{34}H_{64}N_6O_{13}S$
Mol. weight	796,97 g/mol

PEG4350 Biotin-PEG(23)-N_3

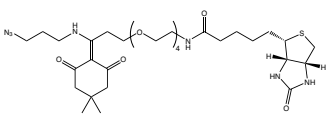
alpha-Biotin-omega-azido 23(ethylene glycol)



CAS-No.	956494-20-5
Formula	$C_{58}H_{112}N_6O_{25}S$
Mol. weight	1325,6 g/mol

PEG7960 Biotin-PEG(4)-Dde-N_3

N-(19-azido-15-(4,4-dimethyl-2,6-dioxocyclohexylidene)-3,6,9,12-tetraoxa-16-azanonadecyl)-5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamide



CAS-No.	1802907-93-2
Formula	$C_{32}H_{53}N_7O_8S$
Mol. weight	695,87 g/mol

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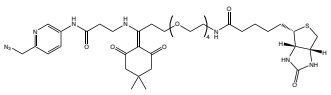
Product details

PEG7970 Biotin-PEG(4)-Dde-Picolyl-N_3

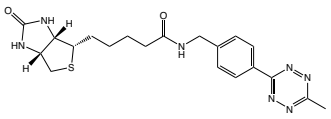
N-(6-(azidomethyl)pyridin-3-yl)-15-(4,4-dimethyl-2,6-dioxocyclohexylidene)-1-(5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamido)-3,6,9,12-tetraoxa-16-azanonadecan-19-amide



CAS-No.	2055048-42-3
Formula	$C_{38}H_{57}N_9O_9S$
Mol. weight	815,98 g/mol

LS-4280 Biotin-MeTz

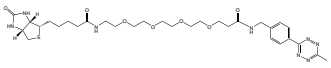
N-(4-(6-methyl-1,2,4,5-tetrazin-3-yl)benzyl)-5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamide



CAS-No.	1802883-51-7
Formula	$C_{20}H_{25}N_7O_2S$
Mol. weight	427,53 g/mol

LS-4290 Biotin-PEG(4)-MeTz

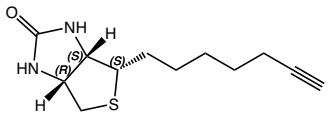
N-(4-(6-methyl-1,2,4,5-tetrazin-3-yl)benzyl)-1-(5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamido)-3,6,9,12-tetraoxapentadecan-15-amide



CAS-No.	1962919-31-8
Formula	$C_{31}H_{46}N_8O_7S$
Mol. weight	674,82 g/mol

LS-4310 DecarboxyBiotin-Alkyne

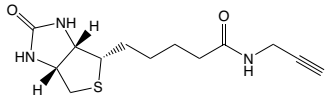
(3aS,4S,6aR)- 4-(6-heptyn-1-yl)tetrahydro-1H-Thieno[3,4-d]imidazol-2(3H)-one



CAS-No.	887915-53-9
Formula	$C_{12}H_{18}N_2OS$
Mol. weight	238,35 g/mol

RL-3490 Biotin-Propargylamide

Biotinyl-N-propargylamide

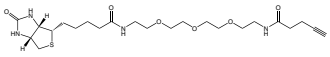


CAS-No.	773888-45-2
Formula	$C_{13}H_{19}N_3O_2S$
Mol. weight	281,37 g/mol

Product details

PEG6805 Biotin-PEG3-NH-Pentynoyl

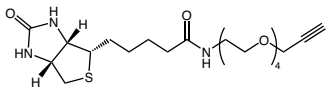
alpha-Biotin-omega-pentynoyl 3(ethylene glycol)



CAS-No. 869082-82-6
Formula $C_{23}H_{38}N_4O_6S$
Mol. weight 498,64 g/mol

PEG4950 Biotin-PEG(4)-alkyne

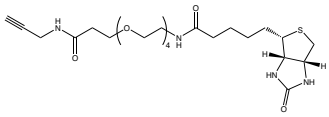
15-[D(+)-Biotinylamino]-4,7,10,13-tetraoxapentadec-1-yne



CAS-No. 1262681-31-1
Formula $C_{21}H_{35}N_3O_6S$
Mol. weight 457,58 g/mol

PEG8010 Biotin-PEG(4)-Alkyne

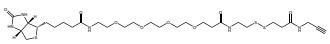
(3aS,4S,6aR)-4-(5,21-dioxo-8,11,14,17-tetraoxa-4,20-diazapentacos-1-yn-25-yl)tetrahydro-1H-thieno[3,4-d]imidazol-2(3H)-one



CAS-No. 1006592-45-5
Formula $C_{24}H_{40}N_4O_7S$
Mol. weight 528,66 g/mol

PEG8110 Biotin-PEG(4)-SS-Alkyne

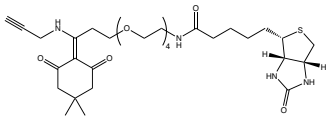
N-(2-((3-oxo-3-(prop-2-ynylamino)propyl)disulfanyl)ethyl)-1-(5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamido)-3,6,9,12-tetraoxapentadecan-15-amide



CAS-No. 1260247-54-8
Formula $C_{29}H_{49}N_5O_8S_3$
Mol. weight 691,92 g/mol

PEG7980 Biotin-PEG(4)-Dde-Alkyne

N-(15-(4,4-dimethyl-2,6-dioxocyclohexylidene)-3,6,9,12-tetraoxa-16-azanonadec-18-ynyl)-5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamide



CAS-No. 1802908-00-4
Formula $C_{32}H_{50}N_4O_8S$
Mol. weight 650,83 g/mol

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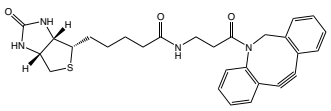
LS-4270 Biotin-DBCO

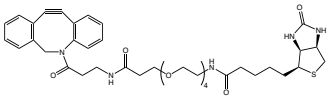
(3aS,4S,6aR)-N-[3-(11,12-Didehydrodibenz[b,f] azocin-5(6H)-yl)-3-oxopropyl]hexahydro-2-oxo-1H-thieno[3,4-d]imidazole-4-pentanamide



CAS-No.	1418217-95-4
Formula	$C_{28}H_{30}N_4O_3S$
Mol. weight	502,63 g/mol

RL-2520 Biotin-PEG(4)-DBCO

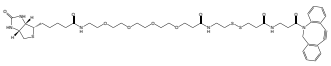
Dibenzoazacyclooctyne-tetra(ethylene glycol)-biotin



CAS-No.	1255942-07-4
Formula	$C_{39}H_{51}N_5O_8S$
Mol. weight	749,92 g/mol

PEG8120 Biotin-PEG(4)-SS-DBCO

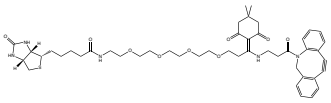
N-(2-((3-(3-(azadibenzocyclooctyn-1-yl)-3-oxopropylamino)-3-oxopropyl)disulfanyl)ethyl)-1-(5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamido)-3,6,9,12-tetraoxapentadecan-15-am ide



Formula	$C_{44}H_{60}N_6O_9S_3$
Mol. weight	913,18 g/mol

PEG8140 Biotin-PEG(4)-Dde-DBCO

N-(15-(4,4-dimethyl-2,6-dioxocyclohexylidene)-19-oxo-19-(azadibenzocyclooctyn-1-yl)-3,6,9,12-tetraoxa-16-azanonadecyl)-5-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)pentanamide



CAS-No.	1807512-43-1
Formula	$C_{47}H_{61}N_5O_9S$
Mol. weight	872,08 g/mol

8. Biotinylated Amino Acids

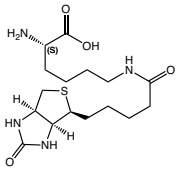
Biocytin is a multi-purpose marker for neuroanatomical studies and the ideal substrate for biotinidase assays. Its strong complex formation with (strept)avidin conjugates opens up a broad range of detection methods. As biocytin is the natural substrate of the enzyme biotinidase, biocytin can be used to measure the biotinidase activity and therefore diagnose biotinidase deficiency. As an intermediate in the metabolism of biotin, biocytin occurs naturally in blood serum and urine.

Product details

LS-3510 Biocytin

N-epsilon-Biotinyl-L-Lysine

CAS-No.	576-19-2
Formula	$C_{16}H_{28}N_4O_4S$
Mol. weight	372,48 g/mol



Reference:

→ *Improved neuronal tract tracing with stable biocytin-derived neuroimaging agents; A. Mishra, K. Dhingra, A. Schuz, N. K. Logothetis, S. Canals;* ***ACS Chem Neurosci*** *2010;* ***1****: 129-38.* https://doi.org/10.1021/cn900010d

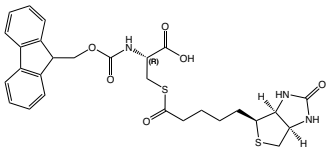
For the introduction of biotin during peptide synthesis, biotinylated amino acid building blocks based on cysteine, glutamic acid, and lysine are available.

Product details

FAA3720 Fmoc-L-Cys(Biotin)-OH

N-alpha-(9-Fluorenylmethyloxycarbonyl)-S-biotinyl-L-cysteine

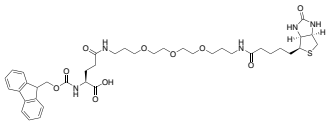
Formula	$C_{28}H_{31}N_3O_6S_2$
Mol. weight	569,69 g/mol



FAA8430 Fmoc-L-Glu(Biotin-TOTA)-OH

N-alpha-(9-Fluorenylmethyloxycarbonyl)-N-gamma-(N-biotinyl-3-(2-(2-(3-aminopropyloxy)ethoxy) ethoxy)propyl)-L-glutamine

CAS-No.	817169-73-6
Formula	$C_{40}H_{55}N_5O_{10}S$
Mol. weight	797,96 g/mol



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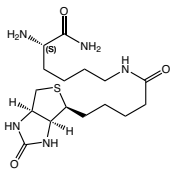
Product details

HAA3430 H-L-Lys(Biotin)-NH_2

N-epsilon-biotin-L-lysine amide

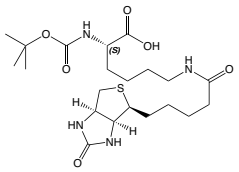
CAS-No.	61125-53-9
Formula	$C_{16}H_{29}N_5O_3S$
Mol. weight	371,50 g/mol



BAA1276 Boc-L-Lys(Biotin)-OH

N-alpha-*t*-Butyloxycarbonyl-N-epsilon-biotinyl-L-lysine

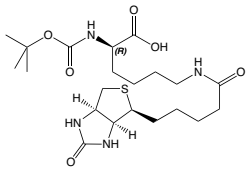
CAS-No.	62062-43-5
Formula	$C_{21}H_{36}N_4O_6S$
Mol. weight	472,6 g/mol



BAA1038 Boc-D-Lys(Biotin)-OH

N-alpha-*t*-Butyloxycarbonyl-N-epsilon-(Biotin)-D-lysine

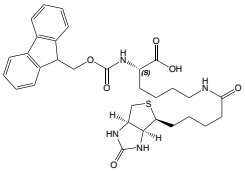
CAS-No.	1272755-71-1
Formula	$C_{21}H_{36}N_4O_6S$
Mol. weight	472,61 g/mol



FAA1443 Fmoc-L-Lys(Biotin)-OH

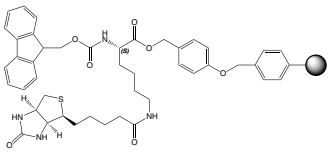
N-alpha-(9-Fluorenylmethyloxycarbonyl)-N-epsilon-biotinyl-L-lysine

CAS-No.	146987-10-2
Formula	$C_{31}H_{38}N_4O_6S$
Mol. weight	594,7 g/mol



WAA5154 Fmoc-L-Lys(Biotin)-Wang Resin

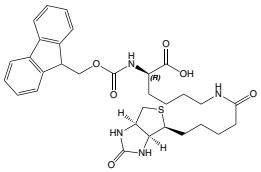
Mesh Size	100-200 mesh
DVB	1% DVB



FAA1451 Fmoc-D-Lys(Biotin)-OH

N-alpha-(9-Fluorenylmethyloxycarbonyl)-N-epsilon-biotinyl-D-lysine

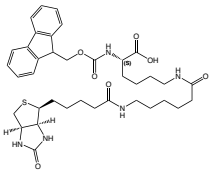
CAS-No.	110990-09-5
Formula	$C_{31}H_{38}N_4O_6S$
Mol. weight	594,7 g/mol



Product details

FAA4670 Fmoc-L-Lys(Biotin-Ahx)-OH

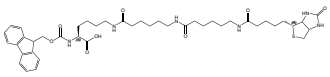
N-alpha-(9-Fluorenylmethyloxycarbonyl)-N-epsilon-[6-(biotinylamino)hexanoyl]-L-lysine



CAS-No.	160158-05-4
Formula	$C_{37}H_{49}N_5O_7S$
Mol. weight	707,88 g/mol

FAA8765 Fmoc-L-Lys(Biotin-Ahx-Ahx)-OH

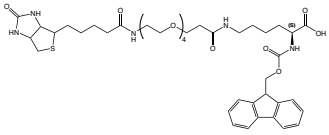
N-alpha-(9-Fluorenylmethyloxycarbonyl)-N-epsilon-(biotinyl-biscaproyl)-L-lysine



Formula	$C_{43}H_{60}N_6O_8S$
Mol. weight	821,05 g/mol

PEG4440 Fmoc-L-Lys(PEG(4)-Biotin)-OH

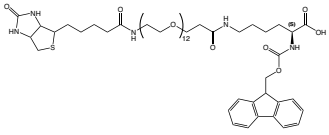
N-alpha-(9-Fluorenylmethyloxycarbonyl)-N-epsilon-[15-(biotinamido)-4,7,10,13-tetraoxa-pentadecanoyl]-L-lysine



CAS-No.	1334172-64-3
Formula	$C_{42}H_{59}N_5O_{11}S$
Mol. weight	842,01 g/mol

PEG4450 Fmoc-L-Lys(PEG(12)-Biotin)-OH

N-alpha-(9-Fluorenylmethyloxycarbonyl)-N-epsilon-[alpha-Biotin-omega-propionyl dodeca(ethylene glycol)]-L-lysine



CAS-No.	1334172-65-4
Formula	$C_{58}H_{91}N_5O_{19}S$
Mol. weight	1194,43 g/mol

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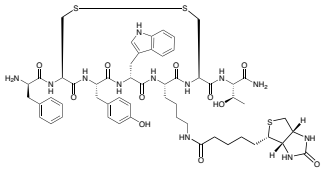
9. Other Biotin Reagents

Product details

LS-1522 TT-232-Biotin diacetate

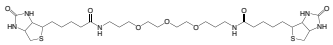
H-D-Phe-Cys-Tyr-D-Trp-Lys(Biotin)-Cys-Thr-NH_2 (disulfide bridged)



Formula $C_{55}H_{72}N_{12}O_{11}S_3$ (net)
Mol. weight 1173,43 (net) g/mol

PEG2080 Biotin-TEG-Biotin

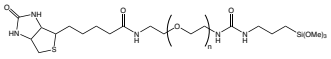
N,N'-Bisbiotin-tetra(ethylene glycol)-diamine



CAS-No. 1263044-47-8
Formula $C_{30}H_{52}N_6O_7S_2$
Mol. weight 672,9 g/mol

PEG4850 Biotin-PEG-Si(OMe)$_3$ (3 kDa)

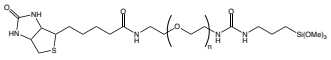
alpha-Biotinyl-omega-trimethoxysilyl poly(ethylene glycol)



Mol. weight 3000 Da

PEG4855 Biotin-PEG-Si(OMe)$_3$ (5 kDa)

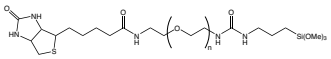
alpha-Biotinyl-omega-trimethoxysilyl poly(ethylene glycol)



Mol. weight 5000 Da

PEG4860 Biotin-PEG-Si(OMe)$_3$ (10 kDa)

alpha-Biotinyl-omega-trimethoxysilyl poly(ethylene glycol)

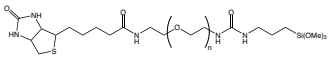


Mol. weight 10000 Da

Product details

PEG4865 Biotin-PEG-Si(OMe)$_3$ (20 kDa)

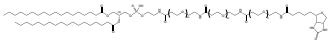
alpha-Biotinyl-omega-trimethoxysilyl poly(ethylene glycol)



Mol. weight 20000 Da

PEG7125 Biotin-PEG(4)-amido-PEG(24)-amido-PEG(24)-DSPE

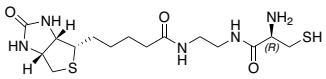
(2R)-3-((hydroxy((4,80,156,172-tetraoxo-176-(2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)-7,10,13,16,19,22,25,28,31,34,37,40,43,46,49,52,55,58,61,64,67,70,73,76,83,86,89,92,95,98,101,104,107,110,11



Formula $C_{164}H_{319}N_6O_{65}PS$
Mol. weight 3478,37 g/mol

RL-8645 Biotin-NH-CH2-CH2-NH-Cysteine*TFA

N-Biotinyl-*N'*-cysteinyl ethylenediamine*TFA



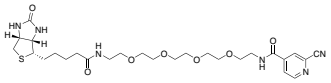
CAS-No. 288144-42-3
Formula $C_{15}H_{27}N_5O_3S_2{*}CF_3CO_2H$
Mol. weight 389,53*114,02 g/mol

While nitriles in general may react with sulfhydryl groups (e.g., from cysteines) in a rather unspecific way, the advantage of α-cyanopyridines (2-picolinonitrils) is their strong selectivity for 1,2-aminothiols (e.g., provided as N-terminal cysteine or internally as non-canonical amino acid). Thus, this reaction may be used for the synthesis of cyclic peptides or to fuse ligands to peptide chains. It is biorthogonal, biocompatible, catalyst-free, and selective; it proceeds readily in aqueous solutions at physiological pH and ambient temperature. The formation of the resulting 2-thiazoline (alternative name: 2,5-dihydrothiazole) is driven by the release of ammonia.

Product details

RL-8635 Biotin-PEG(4)-CINA

2-cyano-N-(16-oxo-20-((3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl)-3,6,9,12-tetraoxa-15-azaicosyl)isonicotinamide



Formula $C_{27}H_{40}N_6O_7S$
Mol. weight 592,71 g/mol

Reference:

→ *The Cyanopyridine-Aminothiol Click Reaction: Expanding Horizons in Chemical Biology; C. Nitsche;* ***SynLett.*** *2024;* ***35****: A-E.* https://dx.doi.org/10.1055/a-2214-7612

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Code of Conduct

As business activity of Iris Biotech GmbH impacts people's lives and health, it must be operated in ethical and correct manner and act with integrity and responsibility. To ensure high ethical standards and fair business practices, Iris Biotech GmbH applies an integrated policy known as its Code of Conduct.

In 2001 Iris Biotech GmbH was founded just at the beginning of the Biotech movement and the first remarkable breakthrough of biotech pharma products. Although the biotech field is rather young compared to other industries we believe on long-term business, a good partnership between our business partners and Iris Biotech GmbH and a good reputation. It is our duty as well as our responsibility to maintain and to extend this over the next generations – based on the principles of an honourable and prudent tradesman which based upon the concept of honourable entrepreneurship.

This Code of Conduct has been developed following the "Voluntary Guidelines for Manufacturers of Fine Chemical Intermediates and Active Ingredients" issued by AIME (Agrochemical & Intermediates Manufacturers in Europe) and the requirements of some of our business associates.

Iris Biotech GmbH commits to hold this Code of Conduct and to include and apply its principles in the management system and the company policies.

Ethics

Iris Biotech GmbH undertakes business in an ethical manner and acts with integrity. All corruption, extortion and embezzlement are prohibited. We do not pay or accept bribes or participate in other illegal inducements in business or government relationships. We conduct our business in compliance with all applicable anti-trust laws. Employees are encouraged to report concerns or illegal activities in the workplace, without threat of reprisal, intimidation or harassment.

Labour

Iris Biotech GmbH is committed to uphold the human rights of workers and to treat them with dignity and respect. Child labour, workplace harassment, discrimination, and harsh and inhumane treatment are prohibited. Iris Biotech GmbH respects the rights of the employees to associate freely, join or not join labour unions, seek representation and join workers' councils. Employees are paid and their working timetable is established according to applicable wage and labour laws. Employees are able to communicate openly with management regarding working conditions without threat of reprisal, intimidation or harassment.

General Policies

Contracts and Secrecy Agreements are binding and the confidential information received is only used for intended purposes. Clear management and organizational structures exist to provide efficient normal working and to address problems quickly. Know-how is protected and intellectual property isrespected.

Health and Safety

Iris Biotech GmbH provides a safe and healthy working environment to the employees and protects them from overexposure to chemical and physical hazards. Products are produced, stored and shipped under the guidelines of the relevant chemical and safety legislation. Risks and emergency scenarios are identified and evaluated, and their possible impact is minimized by implementing emergency plans and written procedures. Safety information regarding hazardous materials is available to educate, train and protect workers from hazards. Preventive equipment and facilities maintenance is performed at suitable periods to reduce potential hazards. Employees are regularly trained in health and safety matters and are informed about product properties and risk classification when it is required.

Environment

Iris Biotech GmbH operates in an environmentally responsible and efficient manner, minimizing adverse impacts on the environment. Waste streams are managed to ensure a safe handling, movement, storage, recycling and reuse, before and after being generated. Systems to prevent and mitigate accidental spills and releases to the environment are in place. All required environmental permits and licenses are obtained and their operational and reporting requirements are complied with.

Production and Quality Management

A quality management system following the Good Distribution Practices (GDP rules) of Active Pharmaceutical Ingredients is established covering all the aspects of the worldwide distribution of products. Regular audits are performed to evaluate the efficiency and fulfilling of the quality system. Process controls to provide reproducible product quality are established. There are preventive maintenance procedures to ensure plant reliability and the lowest risk of failure. Staff is trained periodically about GMP and GDP rules. Procedures are established and installations are designed to avoid cross contamination. Batch and analytical records are kept for inspection and audit purposes for suitable periods according guidelines.

Research and Development

Research and development staff education is appropriate to their functional activity and they are trained to develop, optimize and scale-up the processes. Intellectual property is respected and know-how protected. Development of manufacturing processes reflects the principles of the Green Chemistry according to the American Chemical Society Green Chemistry Institute. Animal testing is not used unless alternatives are not scientifically valid or accepted by regulators. If animal testing is carried out, animals are treated so that pain and stress are minimized.

Terms and Conditions of Sales

All orders placed by a buyer are accepted and all contracts are made subject to the terms which shall prevail and be effective notwithstanding any variations or additions contained in any order or other document submitted by the buyer. No modification of these terms shall be binding upon Iris Biotech GmbH unless made in writing by an authorised representative of Iris Biotech GmbH.

Placing of Orders

Every order made by the buyer shall be deemed an offer by the buyer to purchase products from Iris Biotech GmbH and will not be binding on Iris Biotech GmbH until a duly authorised representative of Iris Biotech GmbH has accepted the offer made by the buyer. Iris Biotech GmbH may accept orders from commercial, educational or government organisations, but not from private individuals and Iris Biotech GmbH reserves the right to insist on a written order and/or references from the buyer before proceeding.

There is no minimum order value. At the time of acceptance of an order Iris Biotech GmbH will either arrange prompt despatch from stock or the manufacture/acquisition of material to satisfy the order. In the event of the latter Iris Biotech GmbH will indicate an estimated delivery date. In addition to all its other rights Iris Biotech GmbH reserves the right to refuse the subsequent cancellation of the order if Iris Biotech GmbH expects to deliver theproduct on or prior to the estimated delivery date. Time shall not be of the essence in respect of delivery of the products. If Iris Biotech GmbH is unable to deliver any products by reason of any circumstances beyond its reasonable control („Force Majeure“) then the period for delivery shall be extended by the time lost due to such Force Majeure. Details of Force Majeure will be forwarded by Iris Biotech GmbH to the buyer as soon as reasonably practicable.

Prices, Quotations and Payments

Prices are subject to change. For the avoidance of doubt, the price advised by Iris Biotech GmbH at the time of the buyer placing the order shall supersede any previous price indications. The buyer must contact the local office of Iris Biotech GmbH before ordering if further information is required. Unless otherwise agreed by the buyer and Iris Biotech GmbH, the price shall be for delivery ex-works. In the event that the buyer requires delivery of the products otherwise than ex-works the buyer should contact the local office of Iris Biotech GmbH in order to detail its requirements. Iris Biotech GmbH shall, at its discretion, arrange the buyer‘s delivery requirements including, without limitation, transit insurance, the mode of transit (Iris Biotech GmbH reserves the right to vary the mode of transit if any regulations or other relevant considerations so require) and any special packaging requirements (including cylinders). For the avoidance of doubt all costs of delivery and packaging in accordance with the buyer‘s requests over and above that of delivery in standard packaging ex-works shall be for the buyer‘s account unless otherwise agreed by both parties. Incoterms 2020 shall apply. Any tax, duty or charge imposed by governmental authority or otherwise and any other applicable taxes, duties or charges shall be for the buyer‘s account. Iris Biotech GmbH may, on request and where possible, provide quotations for multiple packs or bulk quantities, and non-listed items. Irrespective of the type of request or means of response all quotations must be accepted by the buyer without condition and in writing before an order will be accepted by Iris Biotech GmbH. Unless agreed in writing on different terms, quotations are valid for 30 days from the date thereof. Payment terms are net 30 days from invoice date unless otherwise agreed in writing. Iris Biotech GmbH reserves the right to request advance payment at its discretion. For overseas transactions the buyer shall pay all the banking charges of Iris Biotech GmbH. The buyer shall not

be entitled to withhold or set-off payment for the products for any reason whatsoever. Government/ Corporate Visa and MasterCard (and other such credit cards) may be accepted on approved accounts for payment of the products. Personal credit cards are not acceptable. Failure to comply with the terms of payment of Iris Biotech GmbH shall constitute default without reminder. In these circumstances Iris Biotech GmbH may (without prejudice to any other of its rights under these terms) charge interest to accrue on a daily basis at the rate of 2% per month from the date upon which payment falls due to the actual date of payment (such interest shall be paid monthly). If the buyer shall fail to fulfil the payment terms in respect of any invoice of Iris Biotech GmbH Iris Biotech GmbH may demand payment of all outstanding balances from the buyer whether due or not and/or cancel all outstanding orders and/or decline to make further deliveries or provision of services except upon receipt of cash or satisfactory securities. Until payment by the buyer in full of the price and any other monies due to Iris Biotech GmbH in respect of all other products or services supplied or agreed to be supplied by Iris Biotech GmbH to the buyer (including but without limitation any costs of delivery) the property in the products shall remain vested in Iris Biotech GmbH.

Shipping, Packaging and Returns

The buyer shall inspect goods immediately on receipt and inform Iris Biotech GmbH of any shortage or damage within five days. Quality problems must be notified within ten days of receipt. Goods must not be returned without prior written authorisation of Iris Biotech GmbH. Iris Biotech GmbH shall at its sole discretion replace the defective products (or parts thereof) free of charge or refund the price (or proportionate price) to buyer. Opened or damaged containers cannot be returned by the buyer without the written prior agreement of Iris Biotech GmbH. In the case of agreed damaged containers which cannot be so returned, the buyer assumes responsibility for the safe disposal of such containers in accordance with all applicable laws.

Product Quality, Specifications and Technical Information

Products are analysed in the Quality Control laboratories of Iris Biotech GmbH's production partners by methods and procedures which Iris Biotech GmbH considers appropriate. In the event of any dispute concerning reported discrepancies arising from the buyer's analytical results, determined by the buyer's own analytical procedures, Iris Biotech GmbH reserves the right to rely on the results of own analytical methods of Iris Biotech GmbH. Certificates of Analysis or Certificates of Conformity are available at the discretion of Iris Biotech GmbH for bulk orders but not normally for prepack orders. Iris Biotech GmbH reserves the right to make a charge for such certification. Specifications may change and reasonable variation from any value listed should not form the basis of a dispute. Any supply by Iris Biotech GmbH of bespoke or custom product for a buyer shall be to a specification agreed by both parties in writing. Technical information, provided orally, in writing, or by electronic means by or on behalf of Iris Biotech GmbH, including any descriptions, references, illustrations or diagrams in any catalogue or brochure, is provided for guidance purposes only and is subject to change.

Safety

All chemicals should be handled only by competent, suitably trained persons, familiar with laboratory procedures and potential chemical hazards. The burden of safe use of the products of Iris Biotech GmbH vests in the buyer. The buyer assumes all responsibility for warning his employees, and any persons who might reasonably be expected to come into contact with the products, of all risks to person and property in any way connected with the products and for instructing them in their safe handling and use. The buyer also assumes the responsibility for the safe disposal of all products in accordance with all applicable laws.

Uses, Warranties and Liabilities

All products of Iris Biotech GmbH are intended for laboratory research purposes and unless otherwise stated on product labels, in the catalogue and product information sheet of Iris Biotech GmbH or in other literature furnished to the buyer, are not to be used for any other purposes, including but not limited to use as or as components in drugs for human or animal use, medical devices, cosmetics, food additives, household chemicals, agricultural or horticultural products or pesticides. Iris Biotech GmbH offers no warranty regarding the fitness of any product for a particular purpose and shall not be responsible for any loss or damage whatsoever arising there from. No warranty or representation is given by Iris Biotech GmbH that the products do not infringe any letters patent, trademarks, registered designs or other industrial rights. The buyer further warrants to Iris Biotech GmbH that any use of the products in the United States of America shall not result in the products becoming adulterated or misbranded within the meaning of the Federal Food, Drug and Cosmetic Act (or such equivalent legislation in force in the buyer's jurisdiction) and shall not be materials which may not, under sections 404, 505 or 512 of the Act, be introduced into interstate commerce. The buyer acknowledges that, since the products of Iris Biotech GmbH are intended for research purposes, they may not be on the Toxic Substances Control Act 1976 („TSCA") inventory. The buyer warrants that it shall ensure that the products are approved for use under the TSCA (or such other equivalent legislation in force in the buyer's jurisdiction), if applicable. The buyer shall be responsible for complying with any legislation or regulations governing the use of the products and their importation into the country of destination (for the avoidance of doubt to include, without limitation, the TSCA and all its amendments, all EINECS, ELINCS and NONS regulations). If any licence or consent of any government or other authority shall be required for the acquisition, carriage or use of the products by the buyer the buyer shall obtain the same at its own expense and if necessary produce evidence of the same to Iris Biotech GmbH on demand. Failure to do so shall not entitle the buyer to withhold or delay payment. Any additional expenses or charges incurred by Iris Biotech GmbH resulting from such failure shall be for the buyer's account. Save for death or personal injury caused by negligence of Iris Biotech GmbH, sole obligation of Iris Biotech GmbH and buyer's exclusive remedy with respect to the products proved to the satisfaction of Iris Biotech GmbH to be defective or products incorrectly supplied shall be to accept the return of said products to Iris Biotech GmbH for refund of the actual purchase price paid by the buyer (or proportionate part thereof), or replacement of the defective product (or part thereof) with alternative product. Iris Biotech GmbH shall have no liability to the buyer under or arising directly or indirectly out of or otherwise in connection with the supply of products by Iris Biotech GmbH to the buyer and/or their re-sale or use by the buyer or for any product, process or services of the buyer which in any way comprises the product in contract tort (including negligence or breach of statutory duty) or otherwise for pure economic loss, loss of profit, business, reputation, depletion of brand, contracts, revenues or anticipated savings or for any special indirect or consequential damage or loss of any nature except as may otherwise be expressly provided for in these terms. All implied warranties, terms and representations in respect of the products (whether implied by statute or otherwise) are excluded to the fullest extent permitted by law. The buyer shall indemnify Iris Biotech GmbH for and against any and all losses, damages and expenses, including legal fees and other costs of defending any action, that Iris Biotech GmbH may sustain or incur as a result of any act or omission by the buyer, its officers, agents or employees, its successors or assignees, its customers or all other third parties, whether direct or indirect, in connection with the use of any product. For the avoidance of doubt and in the event that Iris Biotech GmbH supplies bespoke or custom product to the buyer's design or specification, this indemnity shall extend to include any claim by a third party that the manufacture of the product for the buyer or the use of the product by the buyer infringes the intellectual property rights of any third party.

General

Iris Biotech GmbH shall be entitled to assign or sub-contract all or any of its rights and obligations hereunder. The buyer shall not be entitled to assign, transfer, sub-contract or otherwise delegate any of its rights or obligations hereunder. Any delay or forbearance by Iris Biotech GmbH in exercising any right or remedy under these terms shall not constitute a waiver of such right or remedy. If any provision of these terms is held by any competent authority to be invalid or unenforceable in whole or in part the validity of the other provisions of these terms and the remainder of the provision in question shall not be affected. These terms shall be governed by German Law and the German Courts shall have exclusive jurisdiction for the hearing of any dispute between the parties save in relation to enforcement where the jurisdiction of the German Courts shall be non-exclusive.

Get in Contact

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info@iris-biotech.de
www.iris-biotech.de

Distribution Partners

The list contains the current distributors of Iris Biotech in different regions of the world. The latest list of distribution partners and contact details is available at: *www.iris-biotech.de/distribution-partner*

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Chengdu Yoo Technology Co., Ltd.

Japan:

BizCom Japan, Inc.

Shigematsu & Co., Ltd

Cosmo Bio Co., Ltd.

USA & Canada:

Peptide Solutions LLC

India, Bangladesh, Oman, Sri Lanka, United Arab Emirates:

Sumit Biosciences Pvt Ltd.

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